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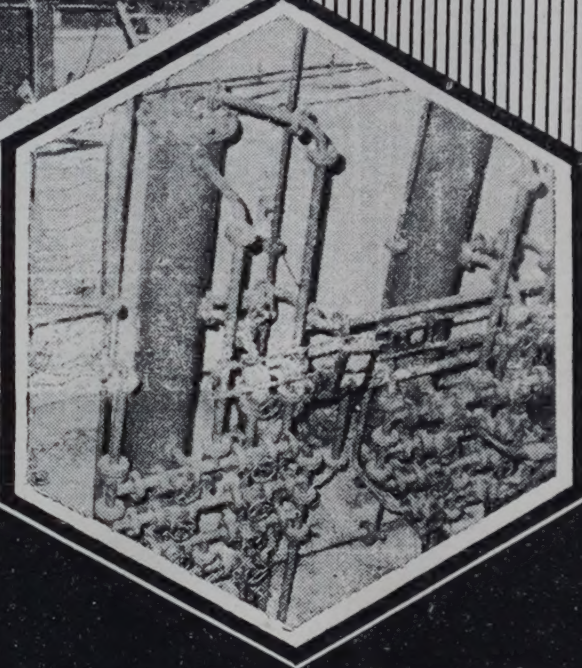
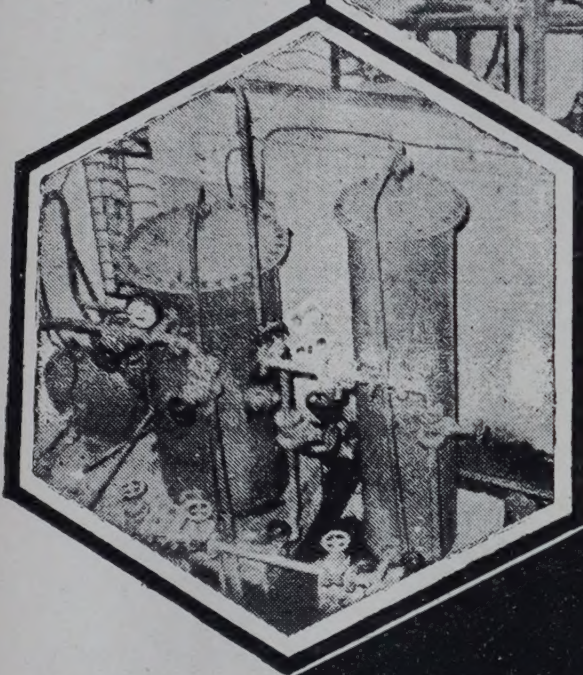
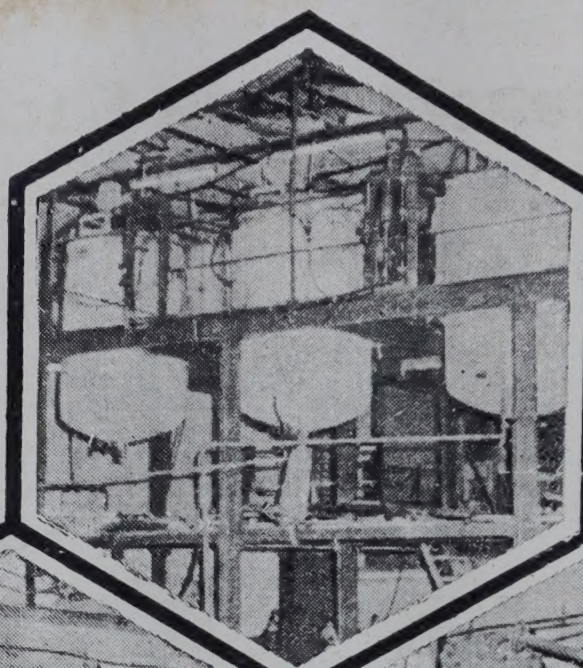
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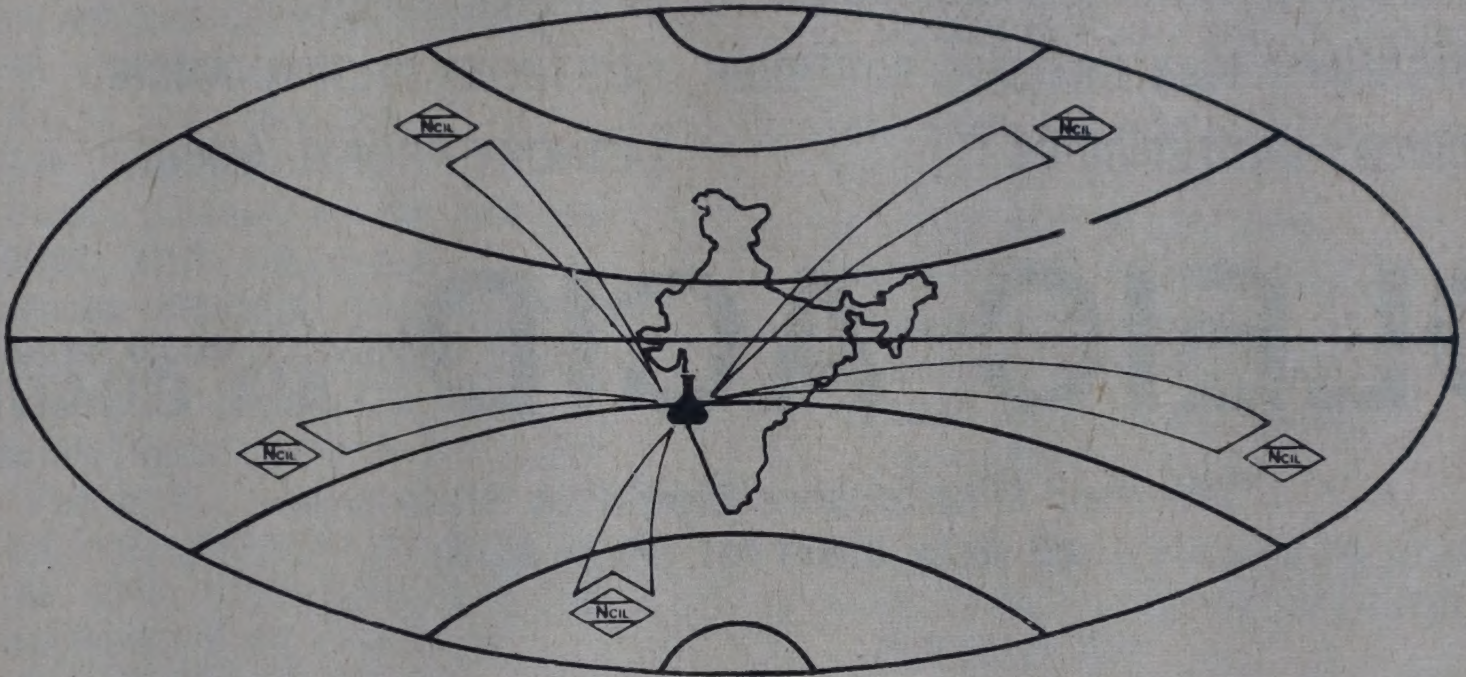


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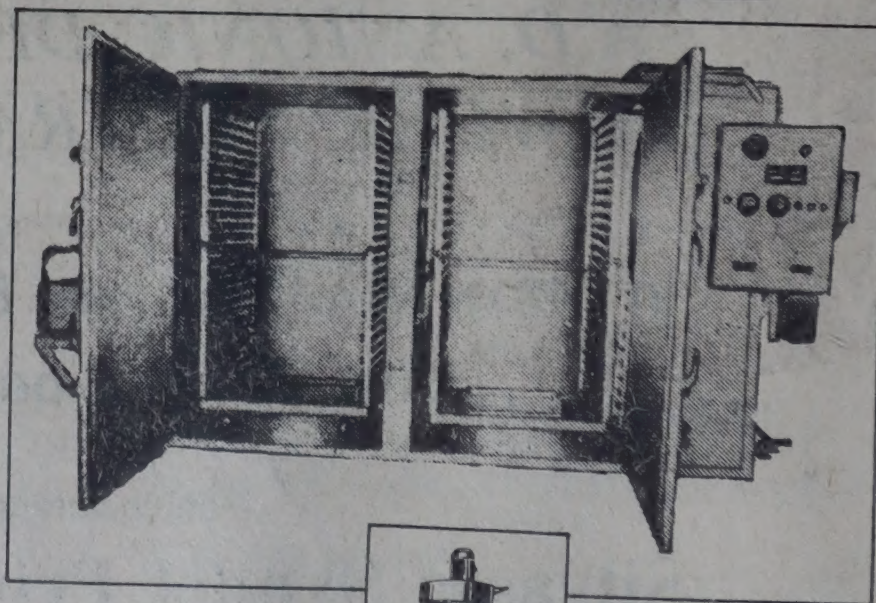
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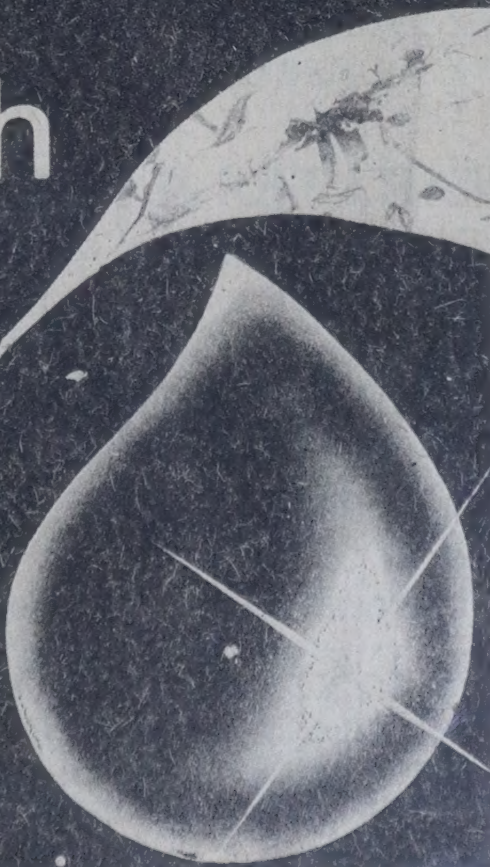


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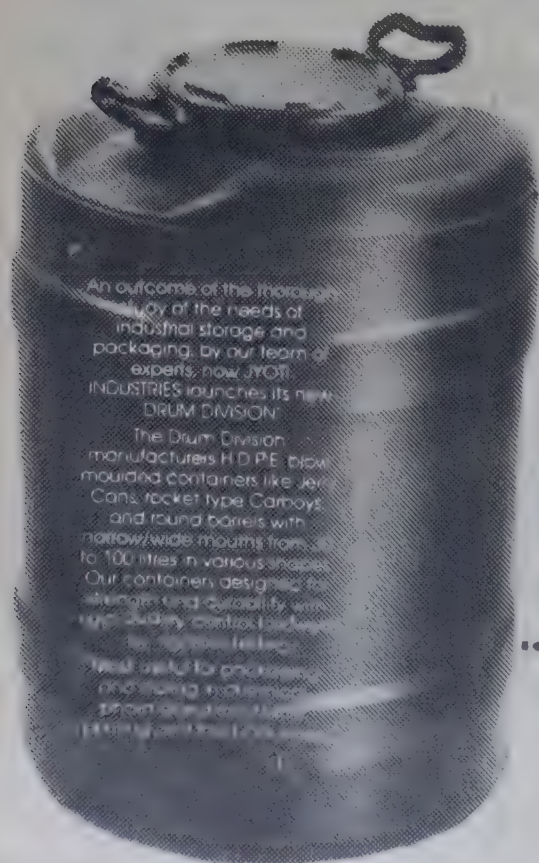
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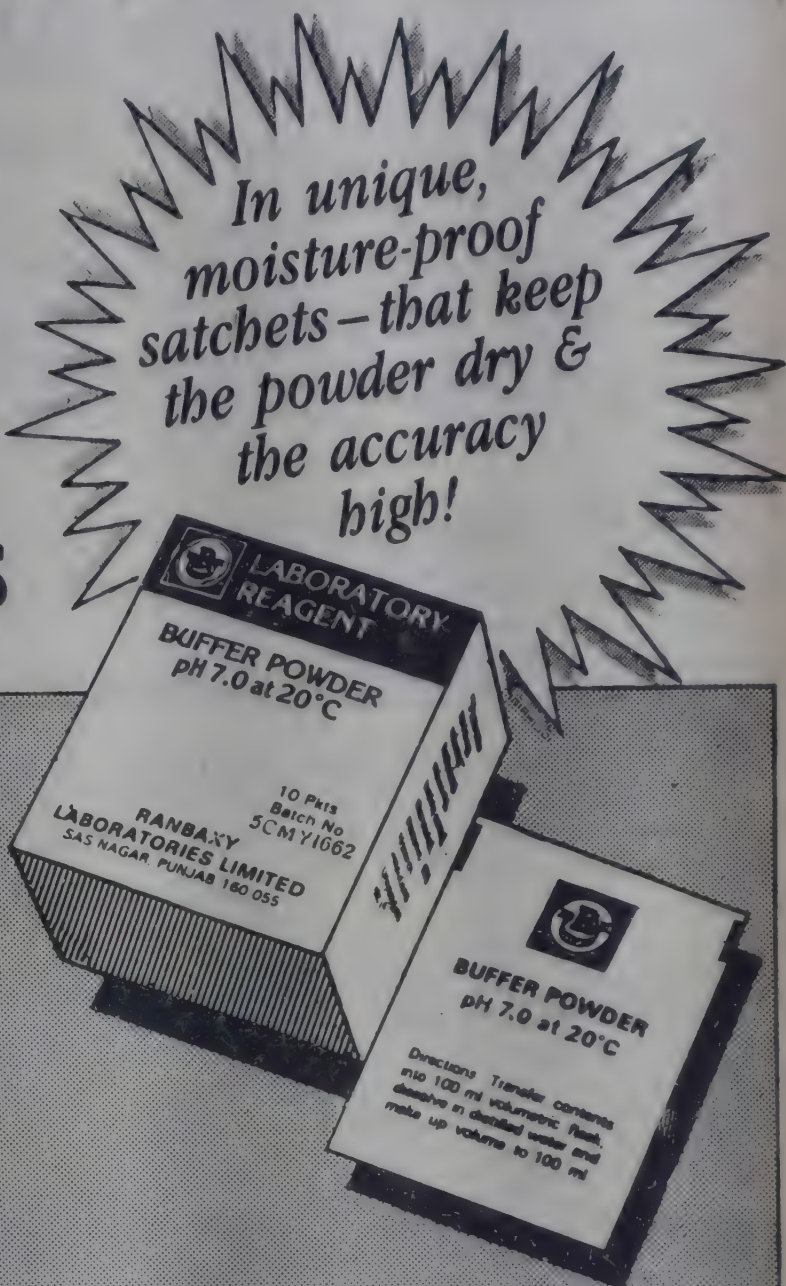
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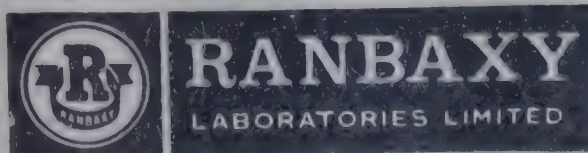


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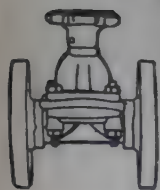
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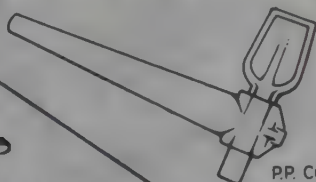
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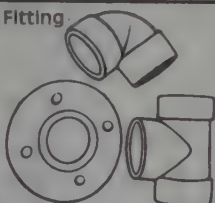


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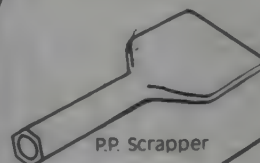
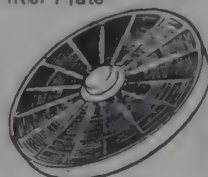


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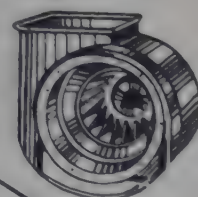


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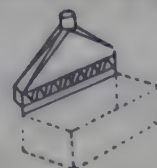
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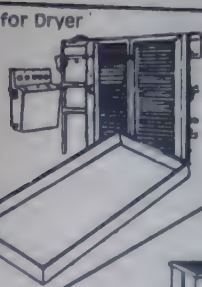
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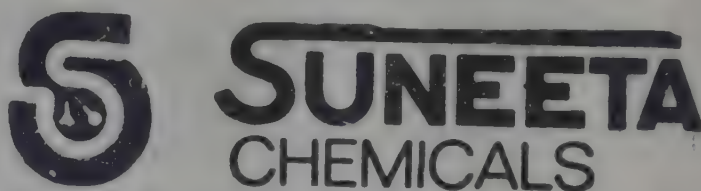
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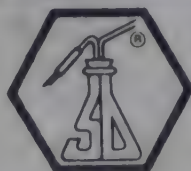
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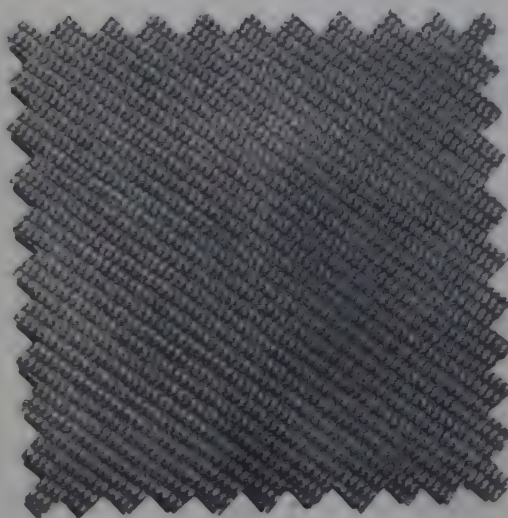
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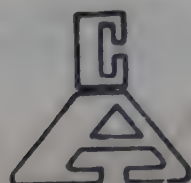
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Editorial & Administrative Office:
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Phones: 4120743/4131198.
Telex: 011-76053 CWLY IN

Madras Office:
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NO. 14

Are we entering the Green House Century ?

The "greenhouse effect" is a phrase popularly used to describe the increased warming of the earth's surface and lower atmosphere due to increased levels of carbon dioxide and other atmospheric gases that, like the glass panels of a greenhouse, let heat in but prevent some of it from going back out. If it weren't for the greenhouse effect, temperatures at the earth's surface today would be some 33°C (60°F) colder than they are, and life as we know it could not exist. Scientists are now debating whether the amount of these "greenhouse gases" will soon be increased by human actions to levels harmful to life on earth. Feared is a rise in temperature of about 5°C (9°F) as early as the middle of the next century — a rate of climate change tens of times faster than the average rate of natural change. How much and how fast temperatures will change and how these changes will alter accustomed patterns of rainfall, drought, growing seasons, sea levels, and so on is controversial. But the greenhouse effect as a scientific proposition is as widely accepted a theory as there is in the earth sciences today.

The Impact on India

The east coast with its lower continental slopes and higher frequency of storms will be more vulnerable to the expected rise in sea level as a result of the predicted global warming. Data collected between 1978 and 1985 shows that the sea level has been rising at one mm a year and that this corresponds roughly to what has been observed in other parts of the world.

The Council of Scientific and Industrial Research has set up a task force of the National Institute of Oceanography, the National Geo-physical Research Institute and the National Physical Laboratory to study the rise in sea level and monitor this closely. Under a UNESCO programme, GLOSS (Global Sea Level Observing System), a network of 297 tide gauge stations are to be set up in the world. Of these 50 will be in the Indian Ocean. Mormugao, Veraval, Cochin, Madras, Visakhapatnam,

Port Blair, Nicobar and Minicoy are among the places selected already. The existing network is not considered adequate for monitoring sea level rise as the gauges are not sensitive enough.

Vulnerable Areas: The task force had identified the areas which would be most vulnerable to a rise in the sea level. The Lakshadweep has 27 separate coral reefs and islands and most of them are low lying with the highest points not more than a few metres high. Some are densely populated. The Andaman and Nicobar Islands are higher but would be affected by the increased strength of the storms in the region related to higher sea level.

It has been pointed out that the entire length of the east coast would be far more vulnerable than the western coast. The lower continental slopes and the storms are expected to result in larger areas being submerged by a rise in sea level while the intensity of the storms would further erode the fragile coastline.

In the western coast, the area between 12 degrees North and 18 degrees North latitude would be more stable than the rest of the coast line. This would mean that roughly the coast south of Mangalore and north of Bombay would be more vulnerable.

It is estimated that one-third of the world's population lives within 60 km of the coastline. In the next century 25% of the world population could be affected by the rise in sea level due to global warming. In the last century the sea level rose by 10 to 15 cm. and by 2050 it is expected to rise further by 23 cm to 116 cm.

Estimates vary: The estimates vary because of incomplete understanding of the various factors that would affect sea rise. However, one-third to one-half of the rise in the level of the sea would be due to thermal expansion of water while the rest would be the result of melting of the polar ice caps and general deglaciation.

tion. By 2100 the rise in sea level could double from 56 cm. to as much as 345 cm.

The task force has suggested that the effect of rise in the sea level would be three-fold. Some areas would get submerged, there would be an increase in storm surges and these could lead to further damage to the coastline and finally, there would be considerable loss of fresh water aquifers because of salt water intrusion.

Global warming is also expected to lead to vast climatic changes, including changes in the pattern of rainfall. These would affect those countries which are dependent on their agriculture. Scientists are aware that a lot of research needs to be done in this area and the world conference on global warming scheduled to be held in Brazil in 1992 will perhaps provide the necessary framework for international cooperation in this field.

There is enough evidence that a global warming has begun which is bound to bring catastrophe in the 21st century destroying agriculture and flooding coastal lowlands like Florida in the United States and Bangla Desh in Asia.

However, there are researchers who strongly believe that natural phenomenon like clouds and ocean currents may mitigate the greenhouse effect. So while most experts still believe in their guts that the globe will warm up, they are now less certain that disaster will result. Nearly everyone is worried, but not as worried as two years ago.

The critical questions are how much the earth will warm, and how fast. Right now forecasts for global warming are little more than hunches based on skimpy evidence from a very young branch of science. Computer models estimate that the mean global temperature will rise between 1.8° and 10°F sometime in the next 50 to 100 years — a very broad range of possibilities. A 2° increase in 100 years might be manageable, while 9° over 50 years could raise sea levels and burn out croplands at a disastrous clip. Resolving the debate among climatologists will take a while.

Yet if the uncertainties are great, so are the consequences of misjudgement. Reducing the gases that promote the greenhouse effect could cost trillions — wasted money if the globe isn't warming much after all. But if nobody does anything and the world heats up rapidly, the damage could be incalculable and irreversible.

The facts about global warming are sparse but compelling. Certain gases in the atmosphere, principally

water vapour and CO_2 , trap heat radiating from the earth's surface. If they did not, the earth's average temperature would be roughly 0°C instead of just over 59° and everything would be frozen solid. Human activity creates greenhouse gases that include CO_2 (mainly from combustion), methane (from crops and livestock) and chlorofluorocarbons, or CFCs (from aerosol sprays, cans, air conditioners, and refrigerators).

Unquestionably the greenhouse gases mankind is spewing forth are accumulating in the atmosphere. Regular measurements of CO_2 taken since the 1950s, for instance show that concentrations have increased at the rate of about 0.5% per year. James Hansen, a leading expert with NASA's Goddard Institute for Space Studies, estimates that the CO_2 added to the atmosphere since the Industrial Revolution got rolling about 1800 has the heating power of roughly one watt — equal to a single tiny Christmas tree bulb — per square meter of the earth's surface. That may not sound like much, but it doesn't take a lot to alter the world as we know it. The global mean temperature at the height of the last ice age 180,000 years ago was 51°, just 8° cooler than today.

Add to these facts three pieces of circumstantial evidence and it becomes clear why alarms are sounding: Laboratory analysis of glacial ice as much as 160,000 years old indicates that global temperature and CO_2 levels in the atmosphere do in fact rise and fall together. Temperature readings that are not necessarily reliable suggest that the globe has warmed about 1° in the past 100 years. And the decade of the 1980s was the warmest in this century.

Some of the unanswered questions are most intriguing. Global climate is the product of interactions among many elements. The largest single factor is the oceans, which have 1,000 times more capacity to store heat than the atmosphere. But climate is also affected by land masses, the biosphere (living things), the atmosphere, clouds, glaciers, the sun, the tilt of the earth, and more.

We have had about 10,000 years in our present interglacial, a period the geologists call the Holocene. A number of scientists have suggested that the demise of this interglacial is due and that we will be heading in a thousand years or so back toward the next ice age, a century or two after CO_2 pollution has finally dissolved in the ocean. But the record of the glacial cycles over the past million years suggests that glacial/interglacial cycles follow a sawtooth pattern: ice sheets develop slowly and end rapidly. This sharp recovery then leads to a short interglacial, and the cycle repeats. While some

ents (for example, the Younger Dryas or the Little Ice Age) in climate history do suggest that regional changes can be rapid: more than $1^{\circ}\text{--}2^{\circ}\text{C}$ per thousand years have occurred occasionally, it still appears more likely that the slide to the next ice age will take 10,000 years or more. Massive glaciers, such as those that built up over Canada and Scandinavia in the last ice age, simply cannot be constructed in a decade, a century, or even 1000 years. At typical Canadian snowfalls of some 1 meter (3 feet) per year, it would take 3,000 years to build back the great ice sheet to its 3-kilometer height -- and that only if we make the totally unreasonable assumption that no snow melted in the summer. The cause of the rapid (10,000 year) destruction of the North American and European ice sheets every 100,000 years or so for the past million years is still a matter of debate, and scientists still aren't sure of the precise physical mechanisms of this 100,000 year glacial/interglacial cycle. Whatever the exact cause or causes, it is known that nature can change the climate substantially, that CO_2 and methane concentrations in the air seem to move in concert with temperature trends; and that humans and other living things will be dramatically affected along the way.

Humans are not simply passengers holding a temporary ticket on planet Earth's ride through the galaxy. We are actively altering the surface of the land and the composition of the atmosphere. These factors affect the natural flows of energy and materials around the planet and in turn are altering the climate. And while it usually takes nature thousands of years to create several degrees of temperature change on a globally sustained basis, human beings can do so in a century or less.

Those who argue against the Green House effect refer to the case of Missing CO_2 .

The finite quantity of carbon on earth is recycled through the atmosphere, water and living things. Plants, for instance, take carbon dioxide from the atmosphere, break it apart, give off the oxygen, and use the carbon to build new cells and grow. When plants die and decay, CO_2 is formed and passes into the air or water. Fossil fuels like coal and oil constitute a huge store of carbon that was taken out of the cycle millions of years ago when the vegetation that created them became trapped in the earth.

Man is putting that carbon back into circulation by burning fossil fuels. Using a rough estimate of how much fossil fuel the modern world has consumed, scientists have calculated how much CO_2 has been released into the atmosphere by the process. But when they analyse

the atmosphere, they find only half the predicted amount.

At a recent hearing held by the National Academy of Sciences' policy committee, James Hansen was asked where the carbon went. "We're not really sure," he replied. "There must be a carbon sink somewhere. Maybe it's the northern forest." Translation: Something big is absorbing carbon -- may be all those trees in Canada and Scandinavia and the U.S.S.R. But for forests to soak up half the CO_2 produced, the trees would have to be either bigger or more numerous than they were before the Industrial Revolution. A spokesman for the American Forestry Association says no evidence indicates that has happened. May be the mysterious sink is something in the oceans, which contain 55 times as much carbon as the atmosphere and 20 times more than plants.

Nor were the experts able to tell the NAS hearing what causes CO_2 levels to rise and fall with temperature through time, as evidenced by those samples of glacial ice. Clearly some natural force or forces can move CO_2 levels up and down independently of man. No one knows what they are -- or what they are up to right now.

One fascinating aspect of the cloud question: Scientists have discovered that sulphur dioxide, a pollutant from smokestacks that is blamed for acid rain, also causes clouds to form. That might explain why many industrial regions of the Earth have not warmed up as much in the past century as the computer climate models say they should have. And it raises the possibility that if the U.S. scrubs sulphur from smokestack emissions, the air will be not only cleaner but hotter as well.

Says Ned Ostenso, an assistant administrator of the National Oceanic and Atmospheric Administration: "Our knowledge of the global system is still pretty rudimentary, but we're learning that it's made up of wheels within wheels within wheels."

No one knows how these feedbacks will add up, and that has led to some sharp exchanges between the alarmists and the skeptics among climatologists. One prominent skeptic, Richard Lindzen, a Professor of meteorology at MIT, recently suggested that in certain climates global warming might decrease the amount of water vapour in the upper atmosphere, which would have a cooling effect. Alarmists scoff at Lindzen's suggestion, arguing that water vapour will increase in the lower atmosphere -- with the opposite result.

With uncertainties like these, it is perhaps not sur-

prising that sometimes the alarmists can be hard to tell from the skeptics. Lindzen says his hunch is that the globe will warm between 1° and 2° in the next century. One of his chief antagonists, Stephen Schneider of the National Center for Atmospheric Research in Boulder, Colorado, says he's 90% sure of at least that much warming. NASA's Hansen, who stunned Congress in 1988 by suggesting that global warming had begun, says he is more optimistic today that the worst-case scenario won't come to pass. Still, he adds, "We could be building a time bomb for ourselves."

The CBO estimates that the charges needed just to keep the CO₂ emission rate where it is would come to \$17 for a ton of coal, which now costs \$ 30, and 8.6 cents per gallon of gasoline. A study by the Electric Power Research Institute, an US industry R&D organisation estimates that after discounting to present value, the cost to the U.S. economy of cutting CO₂ emissions 20% would be \$800 billion to \$3.6 trillion over the next century. The lower estimate assumes growing use of clean energy at a price competitive with coal. Such a technology exists: nuclear power.

Roger Sedjo of Resources for the Future, a research center in Washington, D.C., estimates that planting 1.1 billion acres of new forest, roughly equivalent to the area of the contiguous states west of the Mississippi, would soak up all 2.9 billion tonnes of carbon that gets added to the atmosphere each year. Says Sedjo: "We are talking big numbers, increasing the world's forests by some 16% at a cost of may be \$500 billion. But if this is an emergency and it's paid for out of a global checkbook,

it can be done.

Business can do a number of things that make sense in their own right and also help limit global warming. Pacific Gas & Electric is building a \$10 million research center to look for ways to save energy in lighting. J. Pont, among others, is at work on substitutes for CFCs which deplete the ozone layer. Weyerhaeuser is developing loblolly pines that get by with little water. Trees also help conserve energy: Lawrence Berkeley Laboratories and the American Forestry Association estimate that the shade produced by 100 million trees planted in empty spaces in suburban and commercial neighborhoods around the country could save \$4 billion a year in air conditioning bills.

One creative new product comes from Ben & Jerry's Homemade Inc. The Vermont gourmet ice cream maker is mixing a new flavour called Rain Forest Crunch that contains Brazil nuts harvested from the wilds of the Amazon jungle. Since carbon dioxide entering the atmosphere as a result of deforestation accounts for roughly 20% of the worldwide annual build up of CO₂, Ben & Jerry's figures that creating demand for nuts might save the trees from the settler's axe — and help curb global warming.

Think of the salve to your conscience next time you happen on some Rain Forest Crunch. Eat all you want. Save a tree.

— T.P.S. RAJAN

(Source: Peter Nulty in *Fortune*, April 9, 1990 and 'Global Warming' by Stephen Schneider.

CHEMARENA

L. VENKITESWARAN

Kemira's novel pulping process

Kemira of Finland claim to have a new process for pulping without the use of chlorine or sulphur dioxide. The process is successful in 100 kg. batches and is expected to be scaled up. The active agent is formic acid for pulping and bleaching with hydrogen peroxide follows. The pulping is said to be at only 100°C and under atmospheric pressure but recovery cycle for formic acid is essential and perhaps not fully developed.

The bleaching is with alkaline hydrogen peroxide. The process is workable only on hard woods and the residues from "black" liquor after removal and recovery of formic acid may go for concentration and fuel use. It is not clear if the lignin component is fit for any use other than as fuel. It is to be seen if their approach could be better than the alcoholic caustic digestion which claims recovery of lignin in usable form and also the pentosans as pentoses.

Olefines by Dehydrogenation

The new era of dehydrogenation of the saturated short chain hydrocarbons to the olefines has begun with the propane to propylene technology first offered by UOP. This is a move away from steam cracking of naphtha to catalytic dehydrogenation under milder conditions to specific olefines instead of the diverse products from steam cracking. Apart from the changing scenarios in the petroleum products the huge investments in a multiproduct complexes is avoided. Refineries have been able to provide propylene and butylenes from the FCCs which are an essential part when light and middle distillates have to be increased from the heavier fractions. US is probably the only country with large source of propylene from refineries in excess of 40% of the requirements. US also gets most of its ethylene from natural gas and share of naphtha cracking is low. Now better catalyst are being developed for FCC so that proportion of propylene is higher than of C_4^+ to meet the reduced needs of the latter so as to meet the reduced RVP specification for gasoline. Europe has a potential for nearly 1 million tonnes of propylene from refineries but there is not much of recovery.

Natural gas may have varying content of propane/butane and depending on the operations propane or C_3/C_4 mix can be separated as condensate for direct fuel use (as in India) or for chemical feedstock. Saudi Arabia had concentrated on ethane to ethylene and downstream products and only recently turned to propane.

UOP offered the first dehydrogenation process for propane -- Oleflex -- and the first plant is said to be operating in Thailand. There are a reported 14 more such plants under construction/finalisation in S. Korea, Malaysia, Saudi Arabia and numerous other places. Others also offer dehydrogenation technology for propane now -- Phillips Petroleum -- with

their Steam Assisted Active Reforming or STAR and more importantly Houdry with their Catofin technology. North Sea Petrochemicals in Antwerp with capacity of 250,000 MTA and a Mexican plant of 350,000 MTA are to be based on Catofin. Stone and Webster claim to have developed their fluid bed QC (Quick Contact) designs for propane dehydrogenation as well. The latest offer of technology is from Linde of Germany who have completed all trials in a semi-commercial plant at BASF, Ludwigshafen. Linde claim lower costs, and higher yields though no published data are available. It is said the hydrogen dilution used in UOP's Oleflex and vacuum conditions as with Catofin are avoided.

Isobutane cracking (with steam) to isobutylene and propylene has been employed where MTBE was to be the major product. Butane cracking as well as catalytic dehydrogenation to olefines and butadiene have been operated for years but discontinued when naphtha cracker gave these at lower costs. The situation may change. Much depends on the price ratio of C_2 to C_3 olefins and of ethylene to butadiene and relative prices of naphtha and LNG. There is bound to be a greater shift to dehydrogenation for olefines, propylene in particular and of butanes to a lesser extent. Process for ethane dehydrogenation are on the horizon and may emerge in the late nineties. More likely entrants to the field are Foster Wheeler of US and KTI of Holland and perhaps Lurgi.

We may see the end of new naphtha steam cracking capacity as "mother" plants for petrochemicals before the end of this decade. India's plans for naphtha cracking for Haldia have now firmed up and several others for which nominal approvals were granted include for one in Assam. Propane to propylene and ethane (C_3/C_2) to ethylene are finalised for Hazira & Auriya.

Celmex of Mexico's big plans

American Celanese established a joint venture with Mexican partners for petrochemicals and synthetic fibres and this firm Celmex has progressed far in the last 2 decades. With the sell out of American Celanese to Hoechst of Germany the latter are the successors to the 40% equity of Celmex who report sales of \$700 million last year. Cellulose acetate for cigarette filter has been a big item with production of 20,000 tpa and now to be expanded by 50%. Polyester was a top produce of American Celanese and Celmex has a reported 132,000 tpa of staple and yarn. Nylon fibres are a modest 36,000 tpa. The fibres operations are being modernised.

Vinyl acetate	61,000 tpa
2-Ethyl hexanol	70,000 tpa

The interesting point is that the VAM production uses original Celanese process using acetaldehyde and acetic anhydride and Celmex have reached a stage in which the process is not economic for the level of production now and the ethylene based process is to be installed for 75,000 tpa capacity by 1991 at a cost of \$150 million. The acetic acid consumption for VAM will be nearly the same but most of the acetic anhydride will be surplus. India's VOCL have taken up this Celanese process and operating successfully in a fully integrated plant of 15,000-20,000 tpa of VAM and they will be the only user of this technology which competes well with the ethylene process of 10,000 tpa in India.

Celmex is the major purchaser of acetaldehyde from ethylene of the State-owned Pemex which has a monopoly on primary petrochemicals. Acetic acid, acetic anhydride, vinyl acetate and 2-ethyl hexanol are the main derivatives from acetaldehyde and capacities have steadily been expanded and now are reported to be:

Acetic acid	1,82,000 tpa
Acetic anhydride	90,000 tpa

Celmex plans to invest \$700 million over five years and take up acrylic acid and esters also. The production of 2-ethyl hexanol will presumably continue to be based on acetaldehyde as there is no oxo-process programme in the projections.

Wastes yield useful chemicals

Du Pont have been successful in recovering useful chemicals from the wastes of their large nylon 66 operations. This recovery schemes have been worked out over a period of 3 years and the wastes which were being destroyed at considerable expense are now a source of useful revenue. Isobutyl ester of adipic acid is one of these and finds use as a solvent. Another by-product of the nylon complex is 2-pentane nitrile which is found useful for resins. Benzoic acid and phthalic acids also arise as byproduct's in the oxidation of para-xylene and are being recovered. Acetonitrile by product of the acrylonitrile process is being worked up to useful derivatives while

methyl glutaro nitrile (MGN) is recovered from the adiponitrile process (of the Nylon complex). This MGN is hydrogenated using special catalysts to the amine which finds application for urethanes. One of the primary needs has been to identify customers, enduse for a by-product which could be recovered and then to develop recovery process to get the required purity or a conversion process where required.

It is reported that Du Pont expect sales of such by-products or derivatives from wastes to the extent of \$250 million by 1996 and incidentally save \$ 100 million in costs for disposal.

Calcium Carbide Chemistry

Calcium carbide and acetylene derived from it were the links between inorganic and organic chemicals in the early years. Germany depended very much on such acetylene as base for chemicals which they could not get from outside sources during the war years and post war era, "Reppé Chemistry" was the buzzword of that era and acetaldehyde and ethylene were derived from acetylene and these served for the large group of downstream chemicals and polymers.

The petrochemical era took over and totally displaced the acetylene era for organic chemicals except for some special items (chloroderivatives including vinyl chloride), acetylene black, etc. Chemische Werke Huls specialised in making acetylene from natural gas through an electric discharge furnace and continued for several years. But acetylene from cal-

cium carbide continued in East Germany and South Africa as the base for acetaldehyde. South Africa may soon be able to get ethylene from syngas derived from coal in their mammoth coal to liquid fuel plants. India still uses calcium carbide as a source of acetylene for PVC (also chloro solvents where use of acetylene is logical).

Now the reunification of Germany spells the end of calcium carbide era at Schkopau in former East Germany. It is reported that the present capacity of nearly a million tonnes will be phased out in 2 to 3 years. Feedstocks (ethylene?) will be available from former West Germany sources and CW Huls is joining as a partner. One of the main use of acetylene was for acetaldehyde and this will be made from ethylene to link up with the derivatives plant.

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O.P. KHARBANDA

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Dr. O.P. KHARBANDA, Cost & Management Consultant,
501, Olympus, Altamount Road, Bombay 400 026.
Phone: 91-22-362728 Telex: 11-5214 Fax: 91-22-2864091

Volvo — Teams Make Assembly Line Obsolete

Henry Ford revolutionised car manufacture in 1914 with the introduction of assembly line concept replacing the teams approach. History is now repeating itself with teams replacing the assembly line at Volvo's new plant at Uddevalla in south-west Sweden, and this has been widely acclaimed as a breakthrough (Robert Taylor: 'Why Volvo is planning to go back to the future', Finl. Times, London, June 9, 1989) and may well become the forerunner of future auto factories. Roger Holtback, Volvo's car division president states:

We are saying farewell to the traditional assembly line...I hope that one day in the future somebody will be able to stand here and say 'Henry Ford invented the assembly line but Volvo did away with it — in a profitable way'....(after all) it is people who create quality, not technology alone. A robot does a good job only if correctly programmed by humans.

In effect, Volvo is questioning the fundamental assumption behind mass production based on simple, repetitive and unskilled tasks performed under strict time-and-motion controls, but in the process we seem to have lost the 'holistic' view of production. Interestingly, Volvo took to assembly line operation rather late, in 1953 though the company was established as early as 1926. In the 60's, company faced high absenteeism, also high labour turnover, with low productivity. In its efforts to make the work more varied, interesting and attractive, the company based its Kalmar plant on a work-team basis with computer guided carriers bringing components to the decentralised assembly points. Absenteeism (about 8%, less than half of that at the traditional assembly

line plant in Gothenberg) and labour turnover declined and productivity soared. Uddevalla is a much improved version of Kalmar and seeks to enhance the role of the car worker to that of craftsman of the last century — even with well proven though antiquated systems of apprentice and master craftsman. Of course, full use is also being made of high technology in engineering and computer sciences. Workers are grouped in teams of 8-10 in six product plants, the teams are autonomous and responsible for assembly of the complete car, including quality control.

In 1989, the plant achieved its production target of 10,000 cars, breakeven expected in 1990 and the full capacity of 40,000 likely to be reached by 1991. About 40% of the workers are women, assembly is done in a stationary position, not moving lines, special hand tools, ergonomically designed for women, are being used. The noise level is low, natural light and stress-free colour designs on the walls, and there is a conspicuous lack of dirt and smell. The production level for the day is decided by the team itself, co-ordinator is chosen in rotation, and most of the work is carried out by workers standing upright, thanks to a specially designed device which can tilt the car body by as much as 90 degrees. More power is continuously being delegated down the line, thereby posing more challenges to the workers and also encouraging creativity. Training is very elaborate, with a 16-week initiation programme as part of a 16-month development programme. Planning and design was a co-operative effort between the union and the management, operation is on a consensus basis with no supervisors or foremen. Workers and union officials are as enthusiastic as the management and industrial democracy seems to be a reality. Elsewhere in the world, the trend is to use cheap, unskilled labour in the Third World countries to build volume via assembly line operations, but Volvo is convinced that there will always be a market for high quality hand-made cars built in a humane way to the latest environmental standards. On the whole a most commendable effort, which is being keenly watched by entrepreneurs, social scientists and others all over the world.

Dr. Kharbanda, a Fellow of the Institution of Chemical Engineers, is a visiting professor and an author of repute. His recent title: WASTE MANAGEMENT — TOWARDS A SUSTAINABLE SOCIETY (Gower 1990); PROJECT TEAMS — THE HUMAN ELEMENT (Blackwell/NCC & Company, 1990); and COMPANY CULTURE — IT'S ROLE IN AN INDUSTRIALISED SOCIETY (McBury Press, 1990). Available from Vivek Enterprises, 5 S.K. Barodawalla Marg, Bombay 400 026.

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PETROCHEM UNIT IN ORISSA

Thapars sign MoU with Soviet company

The Thapar group is planning to set up a Rs. 2,650 crore joint sector petrochemical project in Orissa. The naphtha cracker project to be put up in either of the port towns of Paradeep or Gopalpur will have a capacity of 3,30,000 mtpa. The group signed a memorandum of understanding (MoU) with the state government and 'MGO' technochim of the USSR for import of technology from the Soviet Union under the terms of Indo-USSR bilateral rupee trade agreement. The import of equipment is, therefore to be done on rupee trade.

The whole project, according to informed sources, is to be totally foreign exchange neutral. The unit, which will manufacture low density polyethylene (LDPE), high density polyethylene (HDPE), polypropylene and polystyrene, will have an equity base of Rs. 662.5 crores out of which foreign holding will be Rs. 132.5 crores and the remaining with the Indian promoters, namely the Orissa Government and the Thapars. The rest of the amount is to be raised through public issues.

The MoU also says that the financing of the project by the Soviets will be on deferred payment basis and at a low interest rate. The feedstock, naphtha, for the project will be imported for about five to six years till the proposed Indian oil refinery comes up at Daitari, according to sources. During the first five years of commercial production, the project is expected to meet its foreign exchange requirements by way of export of products from downstream units to USSR and other countries. The State Government also plans to support the project with a number of downstream units, sources said.

As a means of backward integration, the Soviet collaborators have also agreed, in principle, to consider the possibility of setting up an oil refinery in the State. The Soviet collaborators have

also visited the two sites and have approved both, according to sources. This will be the second petrochemical project in the East with the other one coming up at Haldia.

DGTD has accepted the proposal and has said that while in the past several applications have been rejected for not having a definite tie-up for ethylene this application could, however, be taken up by the licensing committee for review. According to DGTD figures, the gap in capacity of LDPE/LLDPE and HDPE by 1994-95 are 1,18,184 tonnes and 2,45,000 tonnes, respectively.

DOCK THEFTS PARALYSE BULK DRUG UNITS

The importers and exporters of bulk drugs have suffered a loss of about Rs. 2 crores in the last three months owing to thefts and pilferage in the city dock, according to Mr. K.D. Vora, President, Small Scale Industry Bulk Drugs Manufacturers' Association. The association, which has over 60 members, says in a press release that a consignment to the Soviet Union, worth Rs. 50 lakhs packed in a container, was found missing resulting in huge loss to insurance company and the Indian party.

The insurance company had to pay for the loss in valuable foreign exchange. Such thefts tarnish the image of the country besides putting the Indian party in an embarrassing situation, says Mr. Umed Doshi, a bulk drug manufacturer. Mr. Vora cited another example recently, in which case 80 drums of ampicillin and 125 drums of amoxycillin valued at Rs. 1.25 crores have been stolen from the docks. The increasing incidence of thefts has virtually paralysed importers and exporters of bulk drugs. Besides, Mr. Vora says insurance companies are reluctant to cover insurance and demand very high rate of premium. When the country is in dire need

EXCISE DUTY ON CAUSTIC REVISED

Effective 1st November 1990, the Basic Excise Duty on caustic soda lye supplies will be Rs. 1,300 per tonne. On this, Special Excise Duty will be 5%. In other words, the total Excise Duty stands revised to Rs. 1,365 per tonne.

of earning foreign exchange in the current context of ever-increasing petroleum prices, the enforcement authorities should see that strict measures are enforced to prevent thefts in the docks, adds Mr. Vora. The Association President had already met the Additional Commissioner of Police, Mr. S.S. Suradkar, who had assured speedy action. He adds in the press release that the situation at the docks would restore normalcy as it did during the tenure of Mrs. Meera Borwankar as DSP.

FAI AWARD FOR ZUARI AGRO CHEM.

Zuari Agro Chemicals Ltd. a Goa based company, has won the FAI award for the best performance in environmental protection among nitrogenous fertiliser plants in the country during the current year. The award has been instituted by the Fertiliser Association of India to recognise and honour excellence in environment protection.

ORTHOXYLENE IMPORT UNDER OGL URGED

The manufacturers of phthalic anhydride have urged the Government to issue a notification immediately to include orthoxylene in Appendix 6 - list No. 8 - Part I of the import and export policy to enable them to import orthoxylene under open general licence. Orthoxylene is the only raw material for the manufacture of phthalic anhydride which in turn is an essential intermediate for dyes, dyes intermediates, paints, pigments, plastics, plasticizers, printing ink and synthetic resins, etc.

Herdillia proposal rejected

The proposal of Herdillia Chemicals for the manufacture of ethylene oxide and ethylene glycols at Mahad district in UP has been turned down by the govt. The Rs. 270-crore project was proposed with a capacity of 600 metric tonnes of ethylene oxide and one lakh metric tonnes of ethylene glycol at a location called Auraiya. The project cost was to have been met by 50% of equity of Rs. 90 crores; rupee loans from financial institutions for Rs. 156 crores and foreign exchange for Rs. 24 crores. The rejection has been issued on the ground that the company had not tied up for its feedstock. Present IPCL, NOCIL and India Petrochemicals are the major manufacturers of these products. IPCL has an installed capacity of 20,000 tonnes per annum. There is also a proposal to make 5000 tonnes per annum of ethylene oxide and 10,000 tonnes per annum of ethylene glycol from the Maharashtra Gas Cracker Plant.

Reliance and SM Dyechem are also engaged in for ethylene glycol with a capacity of 5,000 tonnes per annum. Meanwhile the government has approved the company's move to shift manufacturing activity for the production of isophorone from a centrally backward area to its existing undertaking at the MIDC's Thane creek industrial area, (both in Maharashtra) in violation of the location policy.

Simultaneously the company has also modified the scheme of finance for financing the project consequent to its decision to split the location in respect of the above products and the other items like metaxyleneol and trimethylenol, to be produced in a backward area. Initially, when all these products are to be produced under the substantial expansion scheme with lower capacities the cost estimate was Rs. 375 lakhs only for a capacity of 600 tonnes per annum of isophorone, 300 TPA of metaxyleneol and 40 TPA of trimethylenol.

But subsequently, the company has decided to implement the isophorone item with higher capacity in one location and the other two products at a different place, necessitating revision in the total project cost at Rs. 1,000 lakhs. The revised cost will be met through internal accruals (Rs. 200 lakhs), rupee loans (Rs. 400 lakhs) and debentures (Rs. 400 lakhs). In the earlier scheme, the company had proposed to raise Rs. 375 lakhs from its internal accruals, which will now be only Rs. 200 lakhs.

Herdillia Chemicals suffered a setback in its six months working ended September 1990. The results of the previous half-year and the current half year are not strictly comparable in view of the loss of revenue and profit in the current year due to the temporary shutdown of the phthalic anhydride and cumene/phenol plant. Overall results for the full year are expected to be satisfactory.

Total income during the period amounted to Rs. 47.35 crores against Rs. 56.13 crores same period last year and Rs. 112.80 crores last year. It has earned a lower gross profit of Rs. 554 lakhs against Rs. 819 lakhs and Rs. 1,548 lakhs for whole of last year. After depreciation (Rs. 120 lakhs against Rs. 115 lakhs) and taxation (Rs. 174 lakhs against Rs. 282 lakhs), the net profit amounted to Rs. 260 lakhs against Rs. 422 lakhs and Rs. 735 lakhs last year.

Other income includes 'accrued income' of Rs. 376 lakhs towards part of company's claim for loss of profit. Final settlement of claim is expected before March 1991. Amongst the new projects, Herdillia Oxides and Electronics Ltd. has commenced trial production in November 1990. Orders have been placed by Herdillia Unimers Ltd. for the major foreign and local long delivery equipment. The civil work in respect of Herdillia Polymers is expected to commence by the end of this year.

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Gulf crisis hits sulphur imports

The present Gulf crisis has thrown India's buying schedules for sulphur out of gear. Supplies in the international markets have dwindled sharply, while prices have shot up by about 10 to 15 per cent. Sulphur is a vital raw material in the manufacture of phosphatic fertilisers. The country imports approximately 18 lakh tonnes of sulphur every year, valued at around Rs. 320 crores.

The Gulf countries of Saudi Arabia, Kuwait, Iraq and Iran supply around 60 per cent of India's requirements. Supplies out of Kuwait and Iraq, which usually despatch four lakh tonnes of sulphur to India yearly (approximately 25 per cent of all requirements) have been completely shut off. Around four lakh tonnes are bought from Canada and the U.S. while anywhere between 2.5 and 3 lakh tonnes of sulphur come from Poland.

To make matters worse, supplies from Saudi Arabia are scarce. To help out its friends, Saudi Arabia has already committed supplies of one lakh tonnes each to Egypt and Morocco while Tunisia will receive a whopping half-a-million tonnes. After meeting these obligations, there will be little left to offer to other buyers in the international markets. Meanwhile, out of the total scheduled imports of 18 lakh tonnes, the

quantity imported during the period April-December this year is 13.50 lakh tonnes, which is one lakh tonnes short of the target. The shortfall is because import of one lakh tonnes of sulphur from Iraq and Kuwait remained unrealised.

Efforts are now on to persuade Poland to supply one lakh tonnes in January, though this is an uncertain prospect given the changing socio-political conditions there. Individual suppliers in Poland are now capable of demanding payments in hard currency than in rupees following the decision to trade in hard currency.

Price of sulphur in the Middle East will be in the range of \$115 per tonne while Canadian prices are expected to be slightly higher. Purchases will be made on 180-day credit arrangements. A tender for one lakh tonnes is being floated. Meanwhile, the entire contracting for rock phosphate for the current financial year has been completed. The target for the current year is 34 lakh tonnes of rock phosphate. Utilisation levels of rock phosphate-based diammonium phosphate and single superphosphate units are at their maximum, but problems may arise if raw materials lying in the ports are not lifted quickly. Diesel shortage and lack of suf-

ficient number of wagons have hampered transportation to the plants.

While rock phosphate and sulphur supplies may be kept up, the scenario with respect to phosphoric-acid based DAP units is bleak. Inadequate imports have already led to closure of a number of DAP units and, within the next few weeks, all 10 units based on imported acid as raw material will shut down. This situation is expected to exacerbate with the decision to import DAP directly instead of phosphoric acid, because this would result in some foreign exchange savings.

HYDROGEN OBTAINED THROUGH ORGANIC PROCESSES

A Japanese scientist claims to have used bacteria to extract large quantities of hydrogen — a promising source of clean energy — from a simple organic mixture, news reports said on Dec. 10. Mr. Fumiaki Taguchi, a microbiologist at Kitasato University, on the outskirts of Tokyo, took bacteria found inside termites and combined them with yeast, starch and an amino acid and put the mixture in a container of water, the daily *Yomiuri* newspaper reported. Just 1 gram (a third of an ounce) of the mixture placed in a litre (quart) of water for 12 hours produced three litres of hydrogen gas, Mr. Taguchi reportedly said.

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DESPITE SODA ASH GLUT

Tata Chem hopes to earn more

Despite the emerging glut situation in its mainstay product — soda ash — Tata Chemicals Ltd. has targeted a higher profit for the current year, according to Mr. Darbari Seth, chairman and managing director of the company. "To the extent it is possible for a management to plan, we have targeted a higher profit", he said, adding, "the implementation of the fertiliser project will not adversely affect Tata Chemicals".

When questioned about the advisability of diversifying into fertilisers at a time when the company's mainstay product was facing a glut situation, Mr. Seth shot back: "Any time is the most opportune time for any company to go into fertilisers." He explained that given the rising population and current production of 6.75 million tonnes of nitrogenous fertiliser against consumption of 7.40 million tonnes, the demand-supply gap will have to be filled with imports.

Tata Chemicals, out of concern for the forex crunch, had drastically reduced its exchange requirement to US \$50 million as against the original estimate of US \$150 million. Mr. Seth said that the fertilisers project is nearly 25 per cent complete. About Rs. 30 crores has been spent already. The Rs. 980-crore project with an installed capacity of seven lakh tonnes per annum, is expected to be viable under the revised fertiliser pricing policy as it is being set up at a low debt-equity ratio of 2:1 against 4:1 for other projects.

The company has set apart Rs. 150 crores from its internal resources; the financial institutions and commercial banks have sanctioned a rupee term loan of Rs. 302 crores. With the completion of the project, rupee resources amounting to Rs. 852 crores would have been tied-up. The company plans to raise Rs. 187.50 crores through issue of partly convertible debentures (PCD) to existing shareholders, Rs. 9.37 crores

from employees, and Rs. 123 crores from non-convertible debentures offered on a rights basis.

The public issue will comprise of preferential allotment of Rs. 38.50 crores to existing shareholders, Rs. 4.02 crores to employees and Rs. 37.97 crores to the public. Tata Chem, the chairman said, was awaiting "deemed export status" for the project before placing orders for major plant and machinery. The supply source for various equipment had already been identified.

Tata Chemicals, which recently entered into an out-of-court settlement with Gas Authority of India Ltd. (GAIL) for a contract to supply gas to its fertiliser project, said it had done so in national interest and in view of the worsening balance of payments position in the country. Mr. Seth said that every day's delay in the implementation of the project could cost the country over Rs. 1 crore in foreign exchange. He refuted the allegation that the delay in implementation of the gas-based fertiliser projects was the cause of over Rs. 2,000 crores worth of gas being flared annually.

He said the HBJ pipeline primarily draws free gas from Basein and can accept only a small part of associated gas through an improvised connection. According to the current reckoning, it would take three years before associated gas can be gathered, compressed and brought onshore. "Even if eight more fertiliser plants were set up along the gas pipeline, there would be no significant reduction in the quantity of gas being flared", he said. Mr. Seth added that while plans were afoot to stop flaring of gas, it would take a couple of years at least before the flaring ceases.

From chemicals to cement

Tata Chemicals Ltd. announced a Rs. 60-crore investment in two projects

— cement and detergents. Announcing this at Bombay on December 3, the chairman and managing director Mr. Darbari S. Seth, said the detergent unit would go off the ground "within 48 hours after we get the registration number". A Rs. 5-crore investment was planned, in the project; the company will begin trial runs immediately.

In recent years, Mr. Seth has been emphasising the sense of service that inspires his projects. "In order to meet competition from Nirma, some giant companies had begun to adulterate soda ash with salt or china clay to increase the weight of the product", Mr. Seth alleged. He claims that Tata Chemicals will provide consumers with "an undiluted, environmentally acceptable product that will give value for money and be a trend setter in the field."

It will use a new type of soda ash for the purpose which has been developed after intense research and experimentation with over 800 formulations. According to a company release, "urgent" steps are being taken to set up facilities in Pithampur in Madhya Pradesh. Tata Chem Detergents, as the product will be called, proposes to take on consumer product giants such as Nirma, Hindustan Lever, Godrej and TOMCO, which is in the process of beefing up its products and market presence.

However, company officials insist that Tata Chem will not be in competition at either end of the market but will carve out its own niche. The exact pricing will, however, remain a secret until the product is launched. As for the cement project, Mr. Darbari Seth said that it would go on stream two-and-a-half years after the company receives the industrial license. Plans are afoot to set up a 250,000 tonnes per year plant for manufacturing ordinary portland cement or 300,000 tonnes per year of Pozzolana portland cement with the object of "improving the environmental utilisation of waste materials and achieving energy efficiency".

Thapars to set up units in AP, Gujarat

Two major projects from the house of Thapars involving a total investment of over Rs. 53 crores are coming up in the state of Andhra Pradesh and Gujarat. Floated by the Ballarpur Industries (assets at 1987-88 Rs. 45,323 lakhs), the first project is for the manufacture of aniline, mononitrobenzene, sulphuric acid and hydrogen, at Visakhapatnam in Andhra Pradesh. The investment is Rs. 48.50 crores.

The second project, coming up in Jamnagar district of Gujarat will manufacture marine products like beta carotene, algae protein biomass and glycerol, the investment being Rs. 4.50 crores. The AP project's capacity is 10,000 TPA of aniline, 9,650 TPA of alum ferric (by product), 13,600 TPA of mononitrobenzene, 6,000 MTPA of sulphuric acid and 1,010 NM³/hr of hydrogen.

The Gujarat unit's capacity is: beta carotene 10 TPA, algae protein biomass 200 TPA, glycerol 50 TPA. The company did not have any problem in getting the projects cleared for as the government put it the Thapars had agreed to undertake a 30 per cent export obligation, in the case of aniline to be manufactured in the AP project. Besides, the manufacture of mononitrobenzene, sulphuric acid and hydrogen are all for captive consumption. The company though initially wanted to manufacture alum ferric also, subsequently, it dropped the idea as it was a reserved item for the SSI. The export obligation is for five years, extendable for another five years if the government so desired.

The Gujarat project, one of the few in the world as the company stated in its application, has good export-potential, so much so that the company has agreed to undertake a 60 per cent export obligation of its annual production of beta carotene, extract of marine algae dunaliella, for a period of five years. Beta carotene is a carotenoid found in leafy green vegetables and also found in a much greater concentrated

form in dunaliella algae, a marine vegetable plant. Since beta carotene is considered a health product abroad and also used as a food additive and natural food colourant, there was considerable scope for its export.

The company further argued that glycerol is a by-product when beta carotene is extracted from the dunaliella algae. Processed dunaliella algae after extraction of beta carotene and glycerol leave a large quantum of biomass which is rich in protein, minerals and vitamins and can be extensively used as a cattlefeed as well as in aquaculture.

Another factor weighing in favour of the project is that cultivation of dunaliella can be taken up only in coastal areas where there is abundant availability of high salinity sea water, high solar irradiation and very low rainfall. In India, the Gujarat coastal belt fulfills these conditions. In view of these favourable factors the government

okayed recently both the projects with usual conditions like the company taking adequate steps in regard to pollution control etc.

The AP project will be financed through internal generation of Rs. 10 crores, loans from FI's, Rs. 10.50 crores, loan debentures, Rs. 11 crores and FE loan Rs. 10.50 crores (total Rs. 48.50 crores), for the project in Gujarat, the means to be employed are internal generation Rs. 166.48 lakhs, FIL's banks (Rupee loan), Rs. 19 lakhs and FE loans Rs. 85.82 lakhs (total Rs. 450.30 lakhs).

Meanwhile the government has also given its consent to the company's revised scheme of financing its Haryana project (cost Rs. 27 crores) for the manufacture of flyash based autoclaved aerated concrete products. The modified scheme involves internal generation of Rs. 1,350 lakhs, debentures Rs. 396 lakhs, loans from FI's Rs. 396 lakhs and FE loans of Rs. 558 lakhs.

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HOC pays record dividend

Hindustan Organic Chemicals Ltd., a Government of India Enterprise has paid a record dividend of Rs. 296 lakhs for the year 1989-90 to Government of India. The cheque was presented by Shri V.K. Aundhe, Director Incharge of the company to Shri M.S. Gill, Secretary, Dept. of Chemicals & Petrochemicals, Ministry of Petroleum and Chemicals, Govt. of India, in Bombay on Nov. 16. HOC had paid dividend for the last 16 years to the Government. There was a marked increase in the company's production and sales during the year resulting in 80% increase in the net profit. The company's operating profit during the year went up to Rs. 59.22 crores compared to Rs. 45.20 crores last year. The net profit touched a new high of Rs. 35.83 crores against Rs. 19.94 crores during the previous year, registering a remarkable increase of 80%.

The total production rose to 2,06,383 tonnes (1,91,123 tonnes). Overall capacity utilisation for Rasayani unit was

103% compared to 101% during the last year and production exceeded the rated capacities in the number of plants like nitrobenzene (110%), aniline (106%), acetanilide (183%), formaldehyde (113%), dinitrobenzene (131%) and nitrochlorobenzene (104%). The capa-

city utilisation at the Cochin unit increased from 58% to 71% in spite of total power-cut for the three months. The company has registered a record sales turnover of Rs. 205.05 crores compared to Rs. 176.58 crores during the last year registering an increase of 16 per cent.

National conference on membrane technology for clean environment

Membrane technology has emerged as an energy efficient, cost effective, simple and environmentally clean technology. It has been showing tremendous potential for applications in the areas of water and air pollution control, recovery of valuable chemicals from effluent and hazardous waste management. Membrane application to waste water treatment is perhaps the second largest application after water desalination. To highlight the latest developments in the above subjects, the Indian Membrane Society is orga-

nising a two day conference on "Membrane Technology for Clean Environment" in N. Delhi during Jan. 28-29, 1991. The deliberations at the conference will help identify major challenges in this vital area and stimulate academic and industrial research activities. For further details contact: Dr. Raj Kumar, Dy. Mgr. (R & D) & Treasurer, IMS, Research Centre, IPCL, PO: Petrochemicals 391 346, Dist. Baroda, Gujarat. Gram: PET-COMPLEX, Tlx.: 0175-365, Phone: 72011, 72031 Ext. 3492/3460.

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IDMA SEMINAR IN CALCUTTA

Speedy revision of drug prices assured

The Indian Drug Manufacturers Association (IDMA) — West Bengal State Board, had conducted a seminar in Calcutta on October 20, 1990 titled 'Health Care System in the Country — and the Drug Industry of Eastern India'. The seminar was inaugurated by Shri Rasheed Masood, Union Minister of State for Health and Family Welfare and Shri Prasantakumar Sur, Health Minister, Government of West Bengal was the chief guest. The seminar was well attended by members of the association and others.

WELCOME ADDRESS —

N.I. GANDHI, PRESIDENT IDMA

Welcoming the delegates to the seminar, Shri Gandhi expressed his gratitude to Shri Rasheed Masood and Shri Prasantakumar Sur, for sparing their val-

uable time and making it convenient to attend. "Your very presence reflects your keen interest in further improving the health standards of our people", he said.

Tracing the growth of the industry, Shri Gandhi noted that the country's requirements of medicines is mostly met by indigenous production. The production of bulk drugs and formulations had climbed from a value of Rs. 610 crores in 1989-90 to Rs. 3,360 crores at present. "From being a net importer of drugs, the country has now emerged as a net exporter. During the last couple of years, India has emerged as a major supplier of bulk drugs both to developed and developing nations which we were importing from not long ago", Mr. Gandhi noted.

Among the achievements the industry could be justifiably proud of was its contribution to the development of the health of the people. These could be measured in terms of the life expectancy of the people, which had increased from 41.2 years fifteen years ago to 58 years now, or the infant mortality rate which had come down from 146 per 1000 to 95 per 1000.

"The industry today is in the forefront of India's science-based and research-based industries with wide ranging capabilities in the complex field of drug manufacture and technology", said Mr. Gandhi, adding that "it ranks highest amongst the most developed in the third world, in terms of quality and technology and a wide range of medicines manufactured".



Shri Rasheed Masood, Union Minister of State for Health and Family Welfare inaugurating the proceedings by lighting a traditional lamp.

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Outlining the targets for the Eighth Plan, Mr. Gandhi noted that the Working Group in the Planning Commission had envisaged targets of Rs. 4,890 crores in formulations and Rs. 880 crores in bulk drugs. Exports were slated to move up to Rs. 5,000 crores by 2000 AD. "These are all ambitious targets", said Mr. Gandhi, "but the industry has full capabilities to meet these challenges, if it is allowed a reasonable return on investment".

Mr. Gandhi also noted that for achieving the export targets, a strong, dynamic and financially sound domestic base was necessary. "If the domestic base is weak, it will undermine our export capabilities in the long run", he noted.

Loan licence continuity urged

Urging the Government to reconsider its decision to abolish the loan-licence system, Mr. Gandhi noted that the

system had not only permitted the SSI sector to use its spare capacity but also helped to significantly reduce the gap between production and demand. "Industry is willing to extend its full cooperation in plugging the loopholes that may be existing in the present loan licence system", he added.

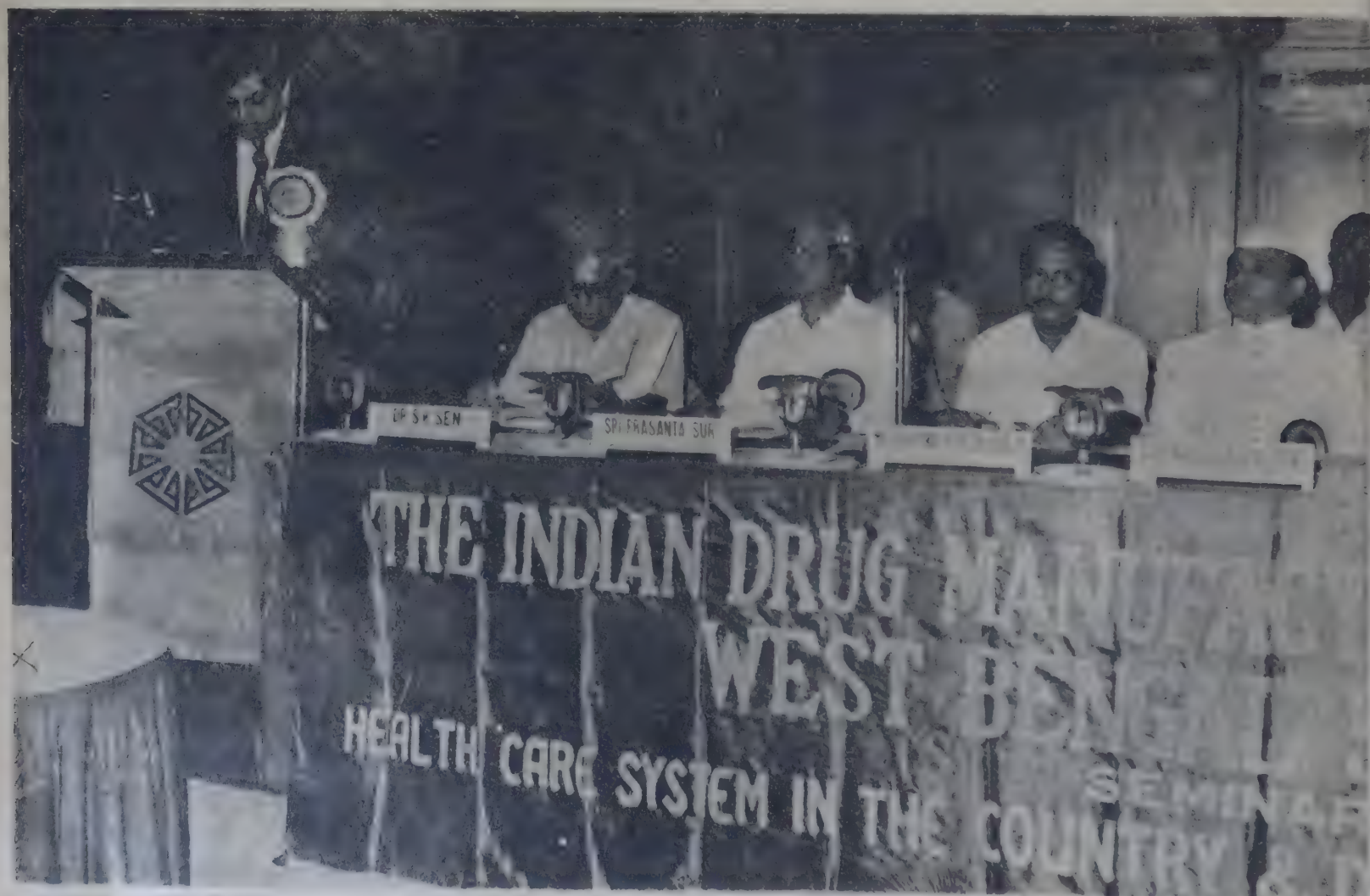
Dual price control

Mr. Gandhi noted that progress in the industry would have been faster if the industry were free of the shackles of price control. "Ironically, this life-saving industry is subjected to dual price control; product-wise price control as well as an overall profitability control". This situation existed inspite of the fact that the industry was nowhere near the profitability ceilings permitted under the DPCO. With the cost of production rising, a measure of price increase is inevitable if the viability of the industry is to be preserved, Mr. Gandhi felt. "Not

allowing for the actual costs incurred in raw materials and packing materials and thereby depriving the manufacturers a fair price, even as per the policy of the government, is not the remedy. To keep the prices down artificially would only discourage production", he said, adding that "what is required is to check the cost of inputs and reduce taxes on medicines". "Tax on medicine is a tax on sickness", he added.

In order to realise the objectives before the industry, Mr. Gandhi urged the Government to

1. ensure reasonable prices to industry
2. channelise fresh investment in the industry
3. encourage R & D by abolition of customs duty on chemicals and equipments required for R & D activities
4. rationalise duty structure so as to encourage bulk drug production in the country



Mr. N.L. Gandhi, President IDMA delivering his welcome address. Others in the picture from left to right: Dr. S.K. Sen, Vice-Chairman, West Bengal State Board, IDMA; Mr. Prasantakumar Sur, Minister for Health and Family Welfare, Government of West Bengal; Mr. A. Bhattacharjya, Chairman, West Bengal State Board, IDMA; and Mr. Rasheed Masood, Union Minister of State for Health and Family Welfare.

have more teaching institutions for higher training of manpower.

Y-NOTE ADDRESS — SHRI DHENDU BHATTACHARJYA, CHAIRMAN IDMA, WEST BENGAL STATE BOARD

Highlighting the achievements of the pharmaceutical industry in the country, Mr. Bhattacharjya noted that per capita consumption figures in the country were very low, at Rs. 34 per annum. This was compared very poorly with the figures of Rs. 340 in South Korea, and Rs. 1,650 in Japan. Although the country as a whole was 'drug starved', with 50% of the population not enjoying the benefits of either the expanded health care system or the modern medicines produced in the country, the Eastern region was particularly badly off both with respect to availability of the latest medical facilities or in growth of the drug industry.

Drug policy and the health care system

While the role of health services, health education, availability of safe drinking water, sanitation measures, nutrition and immunisation programmes to meet the health needs of the population cannot be denied, Mr. Bhattacharjya felt that the availability of drugs held the key to the nation's health. "In this context, the Drug Policy of the country is often reviewed to ensure availability of drugs at reasonable price, to strengthen quality and also create an environment conducive to channelising sufficient investments in the pharmaceutical industry to make drugs available to all by 2000 AD. The industry appreciated such measures and is always willing to co-operate with the Government to achieve such objectives" Mr. Bhattacharjya noted.

To ensure availability of medicines, an investment of Rs. 1,800 crores has been estimated, and Mr. Bhattacharjya opined that such an investment was not likely to come along unless the Government ensured that adequate returns

were permitted for the industry. "The declared Government permissible limit of profit is 8-13 per cent of turnover against current actuals of the organised sector between 3-4 per cent. Any review of the Drug Policy should ensure this minimum profitability, without enforcing undesirable controls and impeding its growth", Mr. Bhattacharjya felt, adding that "our prices compared very favourably with prices in Pakistan, Sri Lanka, Indonesia or even developed countries".

Decrying the urge to take populist measures, Mr. Bhattacharjya noted that medicines cost only 16% of the total health care expenses of a family and only 2.6% of the total budget. "Populist measures will not only harm the health of the nation irreversibly but will also drain out precious resources by making a number of units sick over few years", he said noting that the state-run IDPL had already sustained losses at Rs. 300 crores, and the three Calcutta-based PSU's had sustained losses of Rs. 75 crores since nationalisation.

High incidence of taxes

Mr. Bhattacharjya noted that out of one rupee spent by a consumer for medicine, 40 paise goes to the Government, either as excise duty, sales tax, octroi, purchase tax or turnover tax. "Any welfare state, you will agree should not tax the sick people to such an extent as is being done today in our country", he added.

No controls on SSI

Admitting that the industry has no objection to overall control on profitability, Mr. Bhattacharjya urged the Government to bring about a phased decontrol on prices. Condemning strongly the recent move to bring even the SSI units with turnover above Rs. 1 crore, under price control, he warned that such a move will bring disaster, particularly to the Eastern region where the SSI sector constituted as much as 98 per cent of the total pharmaceutical industry.

Drug purchase policy

Mr. Bhattacharjya urged the Union Health Minister and the Health Minister of West Bengal to frame a policy to abolish regional imbalances in respect of the purchases of drugs made by government departments under various schemes. The current purchase policy was heavily skewed against the Eastern region, which accounted for less than 10% of purchases. He also requested the Government to take the industry into confidence while framing such a policy.

Lacunae in drug rules

Declaring that the drug industry did not believe in any compromise on the matter of quality, Mr. Bhattacharjya pointed out that certain lacunae existed in the Drugs Act which deserved consideration. He urged the Government to take a fresh look at some of these and ensure:

1. Clear guidelines for issuance of "Good Manufacturing Practices" (GMP) certificates.
2. Revisal of packaging norms taking into account the interests of the consumer and the industry.
3. A systematic analysis of the drug inspectors, particularly with respect to their rights to prosecute manufacturers from far off areas.
4. Modification of the concept of a new drug.
5. Continuation of loan licensing system.
6. No dilution of the main objectives of the Drugs Control Administration.

Patents — status quo urged

The Indian Patents Act 1970 had provided the freedom to manufacture bulk drugs to several Indian manufacturers, and had resulted in a strong resurgence of the Indian drug industry. Given these circumstances, there was no overwhelming advantage in India joining the Paris Convention, and Mr. Bhattacharjya urged the Union Minister for Health and Family Welfare to assert on appropriate occasions the need to maintain the Indian Patents Act.

Concluding his address, he noted "We shall be happy if due thought be exercised over the rational implementation of

1. Drug Policy vis-a-vis health care projections
2. Infrastructural facilities of health care
3. Regional drug purchase policy
4. Amendment of Drugs Acts & Rules
5. Preservation of the Indian Patents Act, 1970".

ADDRESS BY SHRI PRASANTAKUMAR SUR, MINISTER-IN-CHARGE, DEPARTMENT OF HEALTH AND FAMILY WELFARE, GOVERNMENT OF WEST BENGAL

In the first part of his address, Shri Sur dwelt upon the fundamental problems of the health care delivery system in the country. Tracing the growth of this system, he noted that it could have said to have begun when the British set up the first modern medical college in the country in Calcutta in 1835. The medical care system was largely urban in location and following Independence was extended to the rural areas, with increased number of medical colleges and other para-medical institutions. The measures taken remained far too short to ensure a massive and necessary redistribution of health resources and manpower throughout the society. "In fact two quite separate systems of health care continued side by side, one urban and curative, consisting of expanding number of hospitals in the major towns and cities, and the other, a network of Primary Health Centres serving the rural 80% of the population but in effect divorced from the urban system", he said.

Paucity of resources, unwillingness of health professionals to serve in rural areas, and the draining of meagre resources for high-tech medical care, were some of the problems in the health care area. While the poor still accept misery and poverty as an act of fate, this dumb acceptance of inferiority will not last for long, Mr. Sur warned, adding

that "the possibility and vision of a classless social order is the only way to achieve health for all".

National drug authority urged

In order to ensure the ready availability of useful and essential drugs of standard quality at reasonable and fair prices, Shri Sur, urged the setting up of a National Drug Authority, as recommended by the Hathi Committee. Such an authority consisting of representatives of the Union and the States shall deal with all inputs, production, pricing, quality control, monitoring availability, new drugs, imports, medical equipment and appliances all over the country. "If there has been a failure to solve this problem so far, it is because the problem has never been considered in its totality", Mr. Sur opined.

Rationalisation of formulations

Although India has the largest number of drug manufacturers, many of these, particularly in the small scale sector, were formulators, turning out many thousands of formulations. Do we really need these many formulations when the WHO has made a list of only 280 essential drugs, the minister asked. "No agency in India has a list of all the allopathic, ayurvedic and homeopathic drugs that are being manufactured in the country; leave alone adequate machinery to monitor the quality of the drugs", Shri Sur said. "It is feared", he continued, "that as much as 20% of the drugs in the market were sub-standard ones. It is high time that the public be informed as to why the Hathi Committee recommendations still remain in cold storage even after a quarter of a century". Concluding his address, with a plea to ensure continued production of essential bulk drugs to make the nation self-sufficient, Shri Sur put forward a number of recommendations, to the Union Minister for Health and Family Welfare. These included:

1. A National Drug and Food Authority must be set up in India with full powers to dictate policy. This Author-

ity should also have regional set up

2. More central assistance should be forthcoming for development of drug control activities and drug testing laboratories in modern medicine, Indian medicine and homoeopathy.

3. There should be uniform policy regarding whether Food and Drug Control should be brought under a single organisation throughout the whole country. While in half the states they are under a single Authority, they are not so in the other half.

4. There should be a more concerted attempt to integrate the best in the various systems of treatment such as allopathy, ayurveda, Unani, homoeopathy etc.

5. The Ministry of Industry should be liberal in granting DGTD licences to drug manufacturers in Eastern India.

6. It is unfortunate but true that even after the establishment of new Government at the Centre, there is practically no representation from Eastern India in various expert committees related to drugs and pharmaceuticals from Eastern India. In the last seven to ten such committees and expert bodies related to drugs formed by the Central Government not even a single representative drug controller or expert has been included from this region. This position should be reviewed.

7. The Drug Regulatory Agency should be technically strengthened by keeping the options open to bring eminent persons from the universities, pharmacy colleges, medical institutions and research institutions. Any myopic view should be scrapped to make it more broad based.

8. Furthermore, in the Central Government purchases of drugs, the drug companies of the Eastern region do not get a fair share. To encourage them a fair amount of share of Government orders should be made available for them.

ADDRESS OF SHRI MASOOD, UNION MINISTER OF STATE FOR HEALTH AND FAMILY WELFARE

Expressing his pleasure at being invited to the conference, Shri Masood expressed that his Government was committed to the task of "Health for all by 2000 AD". "This underlines greater responsibility on the drug manufacturers to produce drugs in the required quality and quantity. The consumer buys a drug with faith; that it is safe and effective for the intended cure. The Government is alive to its responsibility and I am sure the drug producers will not lag behind and be aware of their obligations", Shri Masood said.

Commenting on the quality assurance programme of the Government Shri Masood noted that while the State Governments are responsible for exercising control over manufacture, sale and distribution of drugs through the state, the Central Govt. controlled the quality of imported drugs, laid down regulatory measures and standards, and approved new drugs in the country. The Govt. of India had also modified the Drugs and Cosmetics Rules, making it a statutory responsibility of the manufacturers to follow Good Manufacturing Practices.

Speedy revision of prices

Noting with concern that the growth

rate in the pharmaceutical industry had declined, Shri Masood assured that on its part the Government would strengthen the mechanisms for speedy revision of prices. "The Government will also see to it that prices are fixed so as to ensure to industry the profitability level which was originally envisaged in the Drug Prices Control Order especially with regard to priority drugs", the Minister added.

The Minister also noted that his Government expected that manufacturing units reserve atleast 20% of their production capacity for the production of essential bulk drugs and their formulations. "In this regard it would be willing to liberalise licensing especially for manufacture of those priority bulk drugs which do not involve imports and out-go of foreign exchange", the Minister said.

Fund for quality control

While the Government was taking all steps to strengthen the Central and State Drug Control organisations, Shri Masood called upon industry to assist these organisations by setting aside some funds for creating an infrastructure for quality control. This was of particular importance, in those states where laboratory testing facilities were inadequate. "The issue of approvals and licences in the future could be linked to

the presence of inbuilt adequate quality control in the project designs", the Minister noted.

In order to lower the cost of medical care in the country, the Minister urged that co-ordinating mechanisms be created which would identify health problems which could be dealt with at lower costs and equal efficacy by homeopathic, ayurvedic and other indigenous drugs. "The drug industry could lend a helping hand by making available its knowledge and experience to standardise production of those items which could be launched on a commercial scale", he said. The Minister also urged the industry to prepare a standard list of essential drugs required at different levels of the health service infrastructure with realistic demands for each item. "This would require country-wide drug utilisation studies covering the drug outlets to ascertain marketing, distribution, prescription and use of drugs particularly essential drugs. Such collaborative studies between Government Drug control organisations, research institutes and industry would go a long way in avoiding shortages of any essential/priority drugs in the market, and at different levels of the health services infrastructure", Shri Masood concluded.

(Based on reports in IDMA Bulletin November 21, 1990.)

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Excise duty makes iodised salt costly

Excise duty on certain raw materials that go into production of iodized salt have pushed the product beyond the common man's reach. This has happened because, the government has levied a 15 per cent excise duty on iodizing agents such as potassium iodate and calcium iodate, even though it has exempted manufacture of salt, including iodized salt, from excise duty.

The high price of iodized salt —about Rs. 4 per kg — is likely to defeat the health ministry's ambitious scheme, the national goitre control programme, which aims to totally eradicate the dreaded disease by 1992. Many leading organisations, including Bombay Chamber of Commerce & Industry and the Mahratta Chamber of Commerce & Industry, have pleaded for correction of the policy.

Under the present policy, manufacturers of iodized salt are denied the benefit of Modvat set-off fully exposing them to bear the burden of excise duty on iodate inputs. Even though the government has made a provision for compensation the cost of iodization through grant of a subsidy of Rs. 20 per tonne of the iodized salt, most small and medium-scale manufacturers have not been able to avail of the benefit due to imposition of difficult conditions. For

instance, one of the conditions requires that at least 80 per cent of the iodized salt be sold in goitre endemic areas, which is hard to adhere to.

In addition, wherever the conditions are fulfilled, bureaucratic procedures and delays have been holding up the subsidies. Even those few availing the subsidy receive it at discounted rates due to bureaucratic delays and procedural hassles.

It is understood that health ministry's budgetary allocation for the goitre control programme and for disbursement of subsidies has been grossly under-utilised. If only the unutilised budgetary provision is partially reallocated for excise duty exemption the objective of the scheme could be fulfilled, it is hoped.

Certainly, the government cannot plead that potassium iodate and calcium iodate deserve to be liable to excise duty because they can be put to other uses apart from that as an input for iodized salt.

The only other major use of these iodates is that they are animal-feed supplements. And even on that count, they should not bear excise duty, because the government has exempted dicalcium

phosphate from excise duty, because is an animal-feed, the industry has submitted. It is illogical to levy duty on inputs of iodized salt, the main weapon in the war against goitre, while exemptions on most other drugs which are being used to fight ailments like TB, leprosy, trachoma, blindness, dehydration, malaria and filaria under different national programmes, salt producers have said.

Price rise of iodised salt not 'due to excise duty'

The Government recently said the effect of excise duty on iodising agents like potassium iodate and calcium iodate cannot be a significant factor in the pricing of iodised salt. Referring to a news item which said 15 per cent excise duty on iodate imports has increased the price of salt, an official release said the contribution of the excise duty on potassium iodate towards the cost of iodised salt would be even less than one paisa per kg.

In view of this the duty element of one paisa per kg. 'cannot be responsible for the reported selling price of four rupees per kg, the release said. It added that the existing rate of 15 per cent excise duty was continuing since 1986 without any change and there had been no fresh increase of excise duty on iodising agents.

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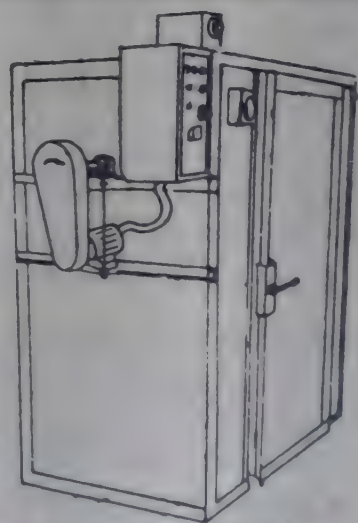
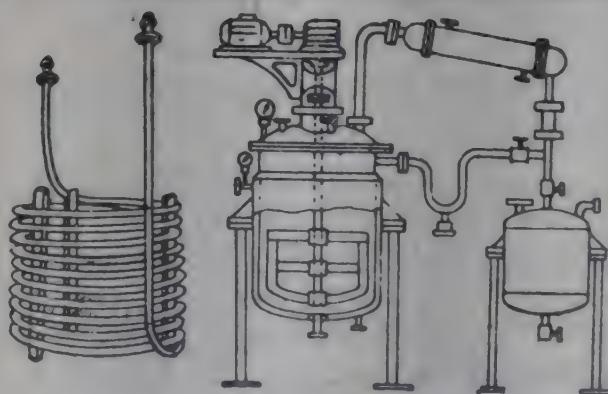
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Aromatic project needs approval

The joint sector aromatics project planned at Manali, near Madras has to be reviewed and cleared by the new Government at the Centre because of the revision in its cost estimates. Mr. H. Krishnamurthy, Chairman and Managing Director of Madras Refineries, one of the promoters said recently that following Mr. V.P. Singh's instructions, the cost estimates were examined and revised from Rs. 1,356 crores to Rs. 1,380 crores. Though the actual revision worked out to Rs. 1,430 crores, the contingencies were pruned from 10 per cent to five per cent because of the actual estimation, lowering the cost of Rs. 1,380 crores. "As such it has to be reviewed by the new Government in keeping with its policy to take a fresh look at all decision", he said.

He hoped it would be cleared by the new Government after the Public Investment Board re-examined the revised estimates. Mr. Krishnamurthy told a meeting of the Madras Press Club that Madras Refineries had secured Central clearance for several smaller projects worth Rs. 6.50 crores for the Eighth Plan. Since these could be completed by 1993, they were working on some more schemes to be taken up during the Plan.

As the Madras Port Trust and the Electricity Board were processing for a satellite port at Ennore to handle coal, the refinery was asking for the establishment of facilities near the Ennore creek for an oil berth. It would be useful to handle LPG and other petroleum products at that site, given its proximity to the refinery and the petrochemical industries coming up in the Manali area. If the aromatics plant also fructified, the oil berth would be an asset. At present the LPG need of the southern region were met through Visakhapatnam port, but there were some problems in this.

Not affected

The Chairman noted that till now all the 12 refineries in the country had

worked to 97 per cent capacity and the Gulf crisis had not affected production or refining. The Government had assured them that the promised crude for the year would be made available. "Elsewhere in the world too, there is no problem about the availability of crude or products. We still have to import them, but the problem is the cost".

Listing the projects to be taken up now by the refinery, he said a lube expansion scheme to step up production from 1.4 lakh tonnes to 2.7 lakh tonnes was to be completed by August 1993 and this would result in a foreign exchange saving of Rs. 90 crores a year. A 0.5 million tonne refinery was to come up in the Cauvery basin at a cost of Rs. 114 crores and would be commissioned in 30 months.

A joint sector additives project in collaboration with Chevron Chemical of America was to be set up in two phases before 1994 at a cost of Rs. 28 crores.

Energy conservation schemes were another highlight of the plans to be undertaken now. Two 20 MW turbines were to be installed at a cost of Rs. 110 crores, to replace old units and augment power generation as the refinery found it more economical to go in for captive generation than risk damage due to poor quality of grid power.

The old refinery was being modernised to step up yield and save energy utilisation.

Own resources

All these projects would be taken up entirely with internal resources without any borrowing or Government funding. The processing capacity was also being stepped up by 0.9 million tonnes at a cost of Rs. 19 crores and would be completed by 1992.

The refinery was also thinking of a steam condensate scheme at a cost of

Rs. 1.3 crores to fully tap the steam generated in the campus and put it to productive use.

A Rs. 8.8 crore hexane unit would be coming up with the prospect of extracting vegetable oils. On the fuel conservation side, Madras Refineries has successfully experimented with the use of compressed natural gas for road transport and Gujarat was eager to try it out.

He was keen that Tamil Nadu should go ahead with this experiment with pilot plant of Rs. 28 lakhs.

It was possible to run 10 buses with one refilling station and four cylinders of gas could take a bus 250 km. A bigger plant would need an investment of Rs. 6 crores.

GUJARAT SORE OVER REDUCED GAS SUPPLY

The Gujarat government is unhappy because it has learnt that the Oil and Natural Gas Commission is planning to reduce the supply of natural gas from 10 million cubic metres to 6.8 million cubic metres per day.

Talking to newsmen, the Gujarat Chief Minister Mr. Chimanbhai Patel who came from Delhi, said that earlier ONGC had promised to supply 10 million cubic metres of natural gas per day on that basis the Gujarat Government had planned to set up gas based petrochemicals complex and two power stations of 615 MW each.

The Chief Minister has specially told the Union Petroleum Minister Mr. S.P. Malavia to "stop playing such a game". Mr. Chimanbhai Patel had also held talks with the Chairman of ONGC and he has promised to reply shortly.

The Chief Minister has also announced that Surat Electricity Company has decided to give relief in power tariff.

POSTING CHEMICAL EXPORTS

Bid to identify areas

Alarmed by the dwindling export earnings, the commerce ministry has asked the joint secretary, Mr. T.S. Vijayaraghavan, to Bombay to identify at least three or four areas of chemicals, exports of which can be quickly boosted with special facilities for supply inputs and prompt procedural corrections. In pursuance of his mission, Mr. Vijayaraghavan, assisted by Mr. R. Tiwari, joint chief controller of imports and exports (JCCI&E) and senior officials from the Reserve Bank of India, Customs department and the Export Credit Guarantee Corporation (ECGC), made an attempt to identify the promising areas at an "open house" of the Chemicals & Allied Products Export Promotion Council (CAPEXCIL) recently. Mr. Vijayaraghavan said that in the past one month, the ministry officials have made many exercises to solve "crash programmes" to spot the

export areas which can be strengthened with minimal extra efforts. Responding to Shree Digvijay Cement's query seeking clarification of the provisions for procurement of indigenous materials in lieu of direct imports, Mr. Tiwari admitted that there are many shortcomings in the provisions and promised that he would make special efforts to correct them. He however, said that JCCI&E had detected many cases of alleged fraud in which companies with their headquarters in Bombay exported goods via places like Madras and Calcutta. In such cases, barring the established trading and export houses, he would investigate the papers relating to all transactions. Mr. V.D. Pendse, deputy controller of foreign exchange at the Reserve Bank, clarified that the RBI has instructed all the commercial banks that all legitimate credit requirements of exporters should be fully met. He how-

ever, admitted that commercial banks have been insisting on 50 per cent margin money for exports effected through advance import licences, but added the Reserve Bank has nothing to do with it.

He suggested that CAPEXCIL should take up the issue with the government. Dealing with a plea to exclude "processed minerals" from the List-B of the Reserve Bank's blanket-exchange permit scheme, he promised to take up the issue with the government. He apprehended that like last year, "this year also exporters may face shortage in supply of GR-1 forms, because the government has not yet decided on its format". The Reserve Bank expects to supply the new forms on April 1. He promised to examine, "if the specific issues are brought to his notice", whether it is mandatory to declare service charges payable to as Indian company in India, in Indian rupee, in the GR-1 form.

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Winding up of Thapar-Du Pont Goa unit recommended

The house committee of the Goa assembly, which is probing the controversial Nylon 66 Thapar-Du Pont project coming up in North Goa, has recommended to the government that it advise the promoters to wind up their activities in the state.

The committee also recommended that the Economic Development Corporation (EDC) and the State Financial Corporation be asked to immediately dissolve their agreements with the company's sister concern, Ballarpur Industries Ltd.

In its 171-page report, submitted to the speaker of the state assembly recently by the committee chairman Mr. A.N. Naik, the government has been asked to stop work on the project. The committee has also admonished the EDC for its involvement in the project and accused the erstwhile Congress (I) government, under Pratap Singh Rane, of collaborating with the promoters in pushing the project through.

The report has also suggested a closer check on the EDC and sought the formulation of clear-cut guidelines for their approval by the state government. The committee has observed that in a tiny

state like Goa a large capital-intensive industry is bound to utilise a very significant percentage of available natural resources and infrastructural facilities, and in turn, would contribute almost nothing to the local economy.

The committee has also said that the EDC should be directed to apply for immediate cancellation of two letters of intent, granted by the union industries' ministry, to the promoters. The government has also been asked to introduce the necessary legislation to change the parameters of EDC's work in order to restrict the involvements of the corporation in joint sector projects to what is possible within its investment capacities and technical expertise.

While asking the government to stop all infrastructural work by the promoters on the site, it has requested the Industrial Development Corporation (IDC) to withdraw its letter permitting such developmental work.

The IDC has also been asked not to acquire the entire 258 hectares of land, supposed to be taken over by the company in a phased manner, but to secure the suspension of the land acquisition proceedings for 170 hectares. The report

has also claimed that the construction of buildings by the company was without the permission of IDC and without the company having a clear title to land.

Moreover, it has alleged that the company has not undergone all the requisite formalities in conversion of the land. The report is silent on one crucial aspect, and that is the question of compensation or otherwise, to the promoters for their claim of investment of Rs. 100 crores on development work at the site till date.

Thapar Du Pont flayed for suppressing data

The Indian National Trust for Art and Cultural Heritage (INTACH) has accused Thapar Du Pont Limited of failing to provide vital environmental data on its Nylon 66 project proposed to be set up in Goa. In a letter to Thapar Du Pont Mr. Harshad Kumar Sharma, director of INTACH's Goa Chapter, has told the company to be frank in providing the data he has asked for.

Otherwise, he said, Thapar Du Pont could "go elsewhere". Earlier INTACH had tried to bring about a dialogue between various environmental groups in Goa and the promoters of the Nylon 66 project — the Thapar group and Du Pont of the US.

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SHORTPAGE OF WATER SUPPLY

Seven Hazira units issued ultimatum

The irrigation department has issued ultimatum, effective from June 30, 1992, to about seven industrial plants of the public and private sector in the Hazira industrial area regarding the shortage of water supply to these units.

The units likely to be affected severely following this cut are the bulk consumers of water, like Reliance Petrochemicals Ltd., National Thermal Power Corporation (NTPC), Essar Gujarat Ltd. and the gas processing plant of the Oil and Natural Gas Commission (ONGC). The other units like the Gas Authority of India Ltd., Indian Oil Corporation's bottling plant and Larsen and Toubro are not likely to be affected much. The Kribhco's giant fertiliser plant took the lead over others by installing its own independent pipeline from the Kakrapar canal. The pipeline was commissioned on March 27 this year.

The present water problem in the Hazira area dates back to the early eighties, when only Kribhco had set up its plant in the area, while the Gujarat Government was still trying to attract the industries and one of the attractions was the assurance to cater to the water demands of the prospective units in the area through the Kakrapar canal. This

canal was meant for having a capacity of 130 million gallons per day (MGD) for agricultural purposes in the area. As on date all the industrial units are drawing water from this canal for their daily requirements.

With the industries drawing water from the canal, it has to be kept open throughout the year. The heavy seepages from the canal and the subsequent water logging in the area surrounding the canal results in heavy damage to the crops. Taking all these factors into consideration, the irrigation department had to issue the ultimatum to the industrial units to go in for their own pipeline and not to depend anymore on the canal.

According to informed sources, Reliance Petrochemicals and NTPC have already approached the GIDC to coordinate the entire pipeline laying project and act as turnkey consultants. The Reliance proposal is already in the final stages and the pipeline laying work is likely to start this month. Essar Gujarat has decided to lay its own pipeline. The important question that arises now is the time and cost factor.

The Kribhco pipeline was expected to be commissioned by December 1988

but could only be commissioned in March, 1990. The total cost of the pipeline works out to Rs. 35 crore. Kribhco also had the advantage of getting the carbon steel pipe with polythene coating from West Germany with practically no import duties. At a meeting held in Ahmedabad in 1985, between the then Central minister, Mr. Yogendra Makwana, the captains of the trade and industry and the state government, Mr. V.V. Patel, the then secretary in the water department, had indicated that it was the government's prerogative to indicate the source and the responsibility to draw the water, he noted, rests with the industries at their own cost.

Later, when the industries learnt that the entire cost will have to be borne by them, the demand which was projected at 140 MGD automatically came down to 100 MGD. The source of the water identified by the government was the Kakrapar river about 82 kms east of the Hazira complex. The cost of laying a pipeline from such a distance was quite high both in terms of time and money. In the meantime, the state government appointed the Gujarat Industrial Development Corporation (GIDC) to act as nodal agency for the planning, designing and execution of the watersupply scheme for cost sharing basis. The scheme of 100 MGD was proposed in two phases.

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GAIL draws up expansion plan for HBJ pipeline

A major expansion of the total capacity of HBJ pipeline will go up to 40 million cubic metres per day, which will be more than double the existing capacity of about over 18 million metres per day.

The Gas Authority of India (GAIL) is expected to submit the proposal to the department of petroleum shortly. After the approval from the department, the proposal will be sent to the Public Investment Board (PIB) followed by cabinet.

This will be the second largest project for GAIL, the first being the original 1700-km HBJ pipeline. This project had cost about Rs. 1,700 crores and was executed by Spie Capag on a turnkey basis. Since the new project is also of the same size, several international companies will be eyeing to bag it if it is decided to float a global tender for the purpose, though no decision as yet has been taken on the issue. However, it may be recalled that a stiff battle was fought by Spie Capag with Snamprogetti to bag the prestigious project.

The new pipeline project has been planned foreseeing growth in demand in the northern region. Earlier GAIL had plans to lay the pipeline from Hazira to

the southern region because of a number of gas-based petrochemical projects and oil refineries coming up there.

However, it was felt that the demand in the northern belt was much more. The new pipeline is expected to cater not only to the demands of the industrial sector but also of the domestic sector.

In fact, replacement of petrol with gas for running automobiles is also being considered actively. Though the gas availability was in abundance from the original pipeline, its transportation was not considered 'convenient' both from safety and expenditure point of view.

According to sources, Engineers India Ltd. (EIL) has presented in the report a detailed study of systems that would go into the laying of the pipeline.

"Foreign collaboration will have to be considered and also the World Bank financing", sources said. However, both the EIL chairman, K.M. Subramanyan and the GAIL chairman, Mr. Vincet Nayyar, were not in Delhi for their comments.

GAIL is also undertaking the Rs. 2,500 crore gas cracker plant in

Auraiya. It proposes to draw gas from the HBJ pipeline itself.

This project, however, is yet to be accorded clearance by the cabinet. HBJ expansion will be accorded priority over the Auraiya cracker by GAIL as the public sector has the expertise in this area.

In fact, GAIL was set up only for one purpose in 1984. The objectives which the company was set up inter alia including transportation, treatment, processing, fraction and to generally deliver or market or sell natural gas in all forms and fractions. GAIL has undertaken small and medium extension projects on the HBJ pipeline after laying of the main pipeline.

These included extension of pipeline from Babrala to Delhi covering about 1,908 kms. From here gas was delivered to NFL (Bijapur), IFFCO, (Aonla), Indo-Gulf (Jagdishpur), NTFC (Auraiya) and NTPC (Auraiya) plants.

To make effective use of the underutilised gas capacity of the HBJ pipeline, GAIL has decided to set up an LPG recovery plant at Bijapur with a capacity of 4,06,000 tonnes per annum of LPG at an estimated cost of Rs. 30 crores. The work on the first phase of the project is nearing completion.

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PIB clears Mangalore Refinery, five power projects

The Public Investment Board (PIB) has cleared the joint sector Mangalore Refinery Project and five other major thermal power projects with a total capacity of 3,250 mw. The total cost of these six projects is estimated to be over Rs. 7,560 crores.

The clearance came at the first PIB meeting held on Nov. 29. This was the first such meeting after the Chandra Shekhar government was formed early last month. Considerable significance is being attached to the PIB approval in view of the huge cost of these projects and their key nature for the country's plan for attaining self-sufficiency in refined petroleum products and thermal power.

According to official sources, all these projects will now be referred to the cabinet, whose approval now appears to be a mere formality. PIB is an inter-ministerial body that looks into such projects from all possible angles before clearing it. The much-delayed Mangalore Refinery is a joint sector project, proposed to be set up by the state-owned Hindustan Petroleum Corporation Limited and Indian Rayon Industries Limited, a Birla Company. The estimated cost of the project is

Rs. 1,100 crores, including a foreign exchange component of Rs. 278 crores.

HPCL and Indian Rayon have already signed a memorandum of understanding to execute the project. The public sector company will have a 52 per cent share in the equity, while Indian Rayon will take the remaining 48 per cent share. The projects, as approved by PIB, has a debt-equity ratio of 4:1.

Its internal rate of return is expected to be 15 per cent, while the external rate of return is fixed at 23.4 per cent. The project is scheduled to be completed in four years once the final clearance is obtained.

The refinery project was originally conceived as a naphtha cracker-cum-refinery complex. However, the Planning Commission had doubts about the viability of a cracker unit in view of the projected demand scenario. Thus the government decided to scrap the cracker and allow only the refinery project to come up.

Accordingly, a revised detailed project report was prepared and submitted to the government. The revised project has the following product mix: liquefied

petroleum gas — 77,000 tonnes, naphtha — 230,000 tonnes, motor spirit — 278,000 tonnes, high speed diesel — 800,000 tonnes, kerosene — 1030,000 tonnes, furnace oil — 238,000 tonnes, bitumen — 100,000 tonnes and sulphur — 13,000 tonnes. The first of the five power projects, cleared by PIB, is the second stage of Farakka super thermal power project, which envisages setting up of two units of 500 mw each. In addition, over 1,100 circuit km of transmission lines would be laid according to the project. The cost of the project is estimated at Rs. 1,427 crores.

The project would be financed by a World Bank loan of \$300 million, a DM 70 million loan from Kraft Werks union, Italian loan of DM 329 million and a Yen, 15,055 million loan from the Japan's Exim Bank. The Kayamkulam and Mangalore projects in Kerala and Karnataka, respectively, have also been cleared. The Kayamkulam project with two units of 210 mw each will have a cost of Rs. 901 crores. The Mangalore project too will have two units of 210 mw each, but its cost is about Rs. 998 crores. Both projects will get bilateral aid from the Soviet Union. The national capital thermal power project with four units of 210 mw capacity is proposed to be set up at Ghaziabad at a cost of Rs. 1,364 crores. The project will get a World Bank loan of \$425 million.

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WORLD BANK-AIDED GAS FLARING PROJECT

Don't open bids, ONGC told

The World Bank has told Oil and Natural Gas Commission (ONGC) to return the price bids unopened to the bidders for the proposed western off-shore project to stop gas flaring from the HBJ pipeline. Unhappy with the ONGC's administration in planning, processing of bids, evaluation, contracting, expediting and monitoring, the World Bank has said ONGC should not open the priced envelopes of bank-financed contracts and return them unopened to bidders and ask for resubmission only after the technical evaluation was concluded.

Sources in ONGC point out that this is probably the first time World Bank has asked an organisation to return the price bids to international bidders. ONGC has sought about Rs. 3,000 crores (\$1,850 million) from the bank to execute the gas flaring project.

The bank team had earlier suggested that all eligible countries should be allowed to participate in the global tenders proposed to be floated for the execution of the gas flaring project. The indication was that India lift the ban on Japanese companies and allow them to participate in the global tenders floated by ONGC. Alternatively, the World

Bank has said, ONGC may inform bidders that they will have an opportunity, at their option, to confirm, amend, resubmit or withdraw the priced envelopes before a predetermined date to be agreed with the bank. "Price bids would be opened publicly", the bank has said.

The bank has also said that it will review all the bidding documents. Till such time ONGC has been asked to holdover new bids for other packages related with the project.

The bids were invited for development of two oilfields — L-II and L-III. Once commissioned, the projects will prevent flaring of gas at Bombay off-shore, currently estimated at 15 million cubic metres a day, and will enhance crude production by one million tonnes annually. The last date for accepting the bids for L-II project was originally November 28. It was later extended to December 26. The bids for L-III, however, have been received. According to sources, two Korean firms — Hyundai Heavy Industries (HHI) and Daewoo — and one US company, McDermot, have submitted bids for the project.

While the technical evaluation of the bids was under way, the price bids were

yet to be opened. According to bank assessment the procurement policy of ONGC has been causing delays in bank projects. The gas flaring project offers an opportunity to streamline this function. For this purpose, the bank has suggested assigning of procurement responsibilities at the Central and regional levels. ONGC has also been told to establish an adequate administrative structure to carry out procurement, simplify procedures, assign levels of authority for decision making in matters related to procurement and standardise documentation and procedures with the institutions. In all probability, ONGC is expected to retender the project incorporating all these conditions laid down by the World Bank.

MALAYSIA HIKES OIL OUTPUT TO EASE SHORTAGE

Malaysia has increased its crude oil production to 650,000 barrels per day to help countries suffering from oil shortage due to the Gulf crisis.

Announcing this the deputy minister in the Prime Minister's department Wong See Wah said recently that Malaysia's readings to help these countries, including ASEAN (Association of South East Asian Nations) member states, has boosted the national income due to increased exports and higher oil prices.

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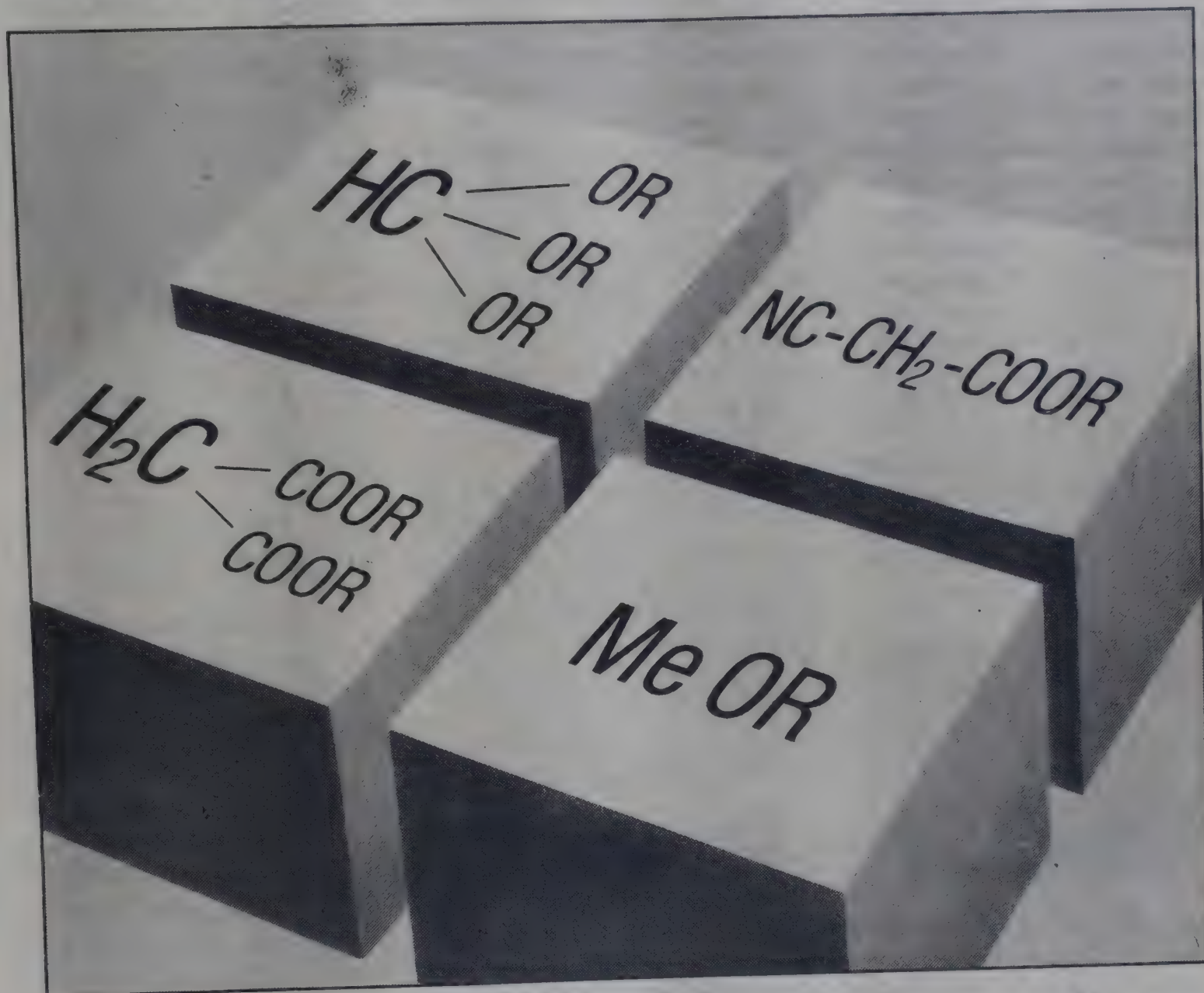
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Higher allocation likely for ONGC

Thanks to recent steep hike in crude prices in the global market, the Planning Commission is considering a generous allocation for the Oil and Natural Gas Commission (ONGC) for the Eighth Plan. Against the Seventh Plan expenditure of Rs. 11,603 crores, ONGC's allocation for the current Plan is expected to be around Rs. 27,000 crores as per the recommendations of the working group on exploration and production set up by the Commission.

According to informed sources, the Commission is favourably inclined to allocate Rs. 17,000 crores to ONGC in the first go for the Eighth Plan. While the working group for the Seventh Plan had recommended an allocation of Rs. 17,000 crores, the original allocation to ONGC was just Rs. 8,750 crores.

However, the actual expenditure by ONGC during the Seventh Plan totalled Rs. 11,603 crores. The year-wise break-up for the Plan is Rs. 2,123 crores in the first, Rs. 2,214 crores in the second, Rs. 2,041 crores in the third, Rs. 2,304 crores in the fourth and Rs. 2,921 crores in the terminal year.

ONGC was able to meet its input costs during the Seventh Plan, due to the fact that crude prices in the international

market had relatively fallen and were as low as \$ 9-10 a barrel in the third quarter of 1986 with consequential impact on the lowering of prices for the equipment, materials and services in the subsequent period.

So much so, that the rig hiring charges, for example, were practically half of what was in 1980-81. This has enabled ONGC to meet its input requirement as envisaged in spite of lower allocation. The change in heart at the Commission now has come in the wake of sharp increase in crude prices in the international market following war-like situation in the Gulf.

Both, the Petroleum Ministry and ONGC have emphasised on the Commission that if the physical targets have to be retained, the inputs for the programme are essential and any reduction in the allocation would have an impact on the physical targets not only for the first year, but also for subsequent years in the Plan period as exploration to production is a continuous process.

The oil prices are hovering between \$ 30 and \$ 34 per barrel. Even if the 11-member OPEC group, as it is reported, plans to stabilise the markets by making available the extra oil, prices are bound to be well above the range

prevailing during Seventh Plan. This point has brought into focus the need of meeting the resource requirement in the oil sector. ONGC plans to add 43.9 million tonnes of oil during the Eighth Plan.

A comparison between the terminal year of Seventh and Eighth Plans provides for an additional allocation of 15 million tonnes increase to 19.7 million cubic metres of gas. In financial terms, this additional oil could mean a saving of \$ 11,220 million in foreign exchange. Resource allocation to the sector, it is felt, is of vital significance. Apart from accelerating the exploratory efforts in the Indian sedimentary basins, it will enable locating of new sources of oil.

IOC'S REFINING MARKETING RECORD IN ASSAM

The Assam division of the Indian Oil Corporation has achieved record in integrated refining-cum-marketing through a put of over 1.50 million tonnes during 1989-90. IOC sources attributed the performance to improvement of the operating efficiency of the Digboi refinery and reinforcement of the supply and distribution system of petroleum products. In the marketing front, the division has enhanced its storage tankage capacity from around 4,000 kl in 1981-82 to nearly 41,000 kl now.

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Maharashtra defers decision on gas turbine project

The Maharashtra Government has deferred a decision to allow the Tata Electric companies setting up the proposed 180 mw gas turbine project at Bombay. At a meeting recently among the State officials, the Maharashtra Pollution Control Board and the Tatas the final clearance for the project was not given as the MPCB has asked for certain more details.

Incidentally the proposed project is to come up in the same complex which houses the companies thermal energy stations. The proposal was made by the Tatas to start a gas turbine station with capacity of producing 120 mw and to produce another 60 mw from a thermal power station using the excess gas and heat generated by the gas turbine. This plant was to be set up as the thermal energy generated by it was not sufficient enough for the ever-increasing power demand of the city.

The proposal was cleared by the State Government and was sent to the Centre for clearance from where it received a green signal. The State Environment Ministry was again asked to look into the project as certain city-based environment groups had raised objection.

The gas turbine project is supposed to have low operating ratio as compared to the conventional thermal power station. In fact of the 180 mw only 120 mw will be generated by gas which will be brought in from Bombay-High through a direct pipe line.

The project will take two years to be completed at an estimated cost of Rs. 350 crores, while the plant load factor of a conventional power plant in the country is at 37 per cent that of the gas turbine will be over 60 per cent and that of the thermal power station will be at around 50 per cent. A meeting to decide about the project was to be held early in December but due to cer-

tain reasons it could not be held. The monthly meeting will obviously not be held in December and the decision will come out only in January next year. The decision of the state government will also be important as it will set a precedent to other power plants that will come up in future.

CALL FOR SMOOTH SUPPLY OF ENERGY INPUTS

The President of the Federation of Indian Chambers of Commerce and Industry (FICCI), Mr. S.K. Birla, has urged the Government to ensure regular supply of critical energy inputs like coal, electricity and diesel for maintaining the tempo of industrial growth. In a news release recently Mr. Birla pointed out that apart from the critical balance of payments position, inflation was the most serious problem today. Calling

upon the industrialists to strive their utmost to keep up the tempo of increasing production, Mr. Birla said in the first five months of the present fiscal year the private industrial sector achieved an increase of 15 per cent in production.

The industry must strive hard to keep up the tempo and establish an all-time record this year, he added. He said the increase in production would definitely help in holding the price-line, industry must also look to all means at its disposal to tackle the real problem of rapid cost increase by intensive cost-control exercise rather than reverting to the soft option of price increase.

The FICCI President also assured the Government of full support of the business community in tackling the twin problems of inflation and foreign exchange crunch. Mr. Birla, however, regretted that the cost of inputs including transport had increased the price considerably.

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Hazira heavy water plant to be commissioned soon

Scientists working at the heavy water plant at Hazira, Gujarat are waiting for the first drop of heavy water to be manufactured from the ammonia hydrogen exchange process to formally signal the commissioning of the plant.

The drop of heavy water will also signify the climax of mastering the technology for manufacturing heavy water through the ammonia hydrogen exchange route. India will be ready to assist others in this technology in case the need arises.

The date of arrival of the first drop of heavy water (D20) is around end-December, a slight delay in the date of arrival from the planned one but it is not far from the targeted date set nearly four years ago.

The project activity began in August 1986 and was expected to be completed by November-end 1990. The delays, if any have been partially due to the inability of some of the local manufacturers to deliver the required goods on time. Though some of the goods were delivered almost 15 months late, the final delay was only about a month.

Set up at a cost of about Rs. 264 crore, this heavy water plant will be the fourth plant which will be using the ammonia-hydrogen exchange monothermal process to recover the heavy hydrogen particles for production of heavy water.

The other three at Baroda, Thal, and Tuticorin. The Hazira plant is almost entirely indigenised.

In the case of the Hazira plant, the ammonia will be supplied from the neighbouring fertiliser plant. The Hazira plant will just use the gas to sieve off the heavy hydrogen particles which will be later used for manufacturing the heavy water. The name plate capacity

of the plant is stated to be about 110 tonnes per annum.

The basic raw material for the plant is the ammonia synthesis gas which is one molecule of nitrogen and three molecules of hydrogen. According to calculations by the scientists there are about 115 heavy hydrogen particles per million particles of hydrogen in the gas.

Thus the scientists will be using the technology of ammonia-hydrogen exchange to retrieve the heavy hydrogen particles from the process till they have progressed from 115 ppm to 99.8 per cent composition in heavy hydrogen.

According to one of the top scientists the process is like: "Finding a needle in the haystack and then collecting these needles to form one composite stack of needlessness only".

So the process finally collects the heavy hydrogen particles and then it is subject to collective burning in a chamber in the presence of pure air which leads to the formation of heavy water. The heavy water board is waiting for the clearance by the Atomic Energy Regulatory Board (AERB) for the last stage of reaction. Each stage of the process of manufacturing the heavy water of Hazira has been cleared by AERB.

Despite having everything well planned out the heavy water plant production will be governed by certain factors external to the plant. First is the raw stock synthesis gas and the deuterium content in it which will be supplied by the fertiliser plant nearby. In case there is a fall in the supply, there will be a fall in the production of heavy water. The second case is the natural gas supply, coming in through the HBJ pipeline. In case there is a fall in the gas supply, this too can hinder production.

Then of course there is the power supply, variation in voltage and frequency which may also hamper the production.

BIOGAS SLURRY IS A BOON

The Biogas plant is not only a giver of energy but the digester slurry is also proving to be rich fertiliser as well as an animal feed. About 20 per cent of the total solids in the digested biogas slurry comes into the sludge, which contains such essential elements like nitrogen, phosphorus, potassium, calcium, boron, copper and iron. The fresh biogas slurry can be used with irrigation water for fertilising certain crops, as the Chinese do. But if the sludge is to be used as manure to synchronise with the cropping cycle, it is better to reduce the moisture content by mixing the slurry with saw dust, charcoal dust, etc.

At the Centre of Science for Village Wardha, techniques are being devised to convert biogas plant slurry into dry and transportable form. The moisture content has been reduced to 30 per cent by drying the slurry in a slurry-drying bed and adding gypsum.

The dried sludge can be enriched with fertiliser or bonemeal. When tried on crops at the Indian Agricultural Research Institute, New Delhi, dried slurry gave better results than wet slurry, farmyard manures or berseem.

It appears that the anaerobic fermentation of diluted cow dung (1:1) in the fermentation tank of the biogas plant improves the quantity and quality of protein due to the proliferation of microbial cells.

The Indian Veterinary Research Institute, Izatnagar (Uttar Pradesh) fed lambs a mixture of dried and found no observable effect on the body condition and growth rate of lambs. In fish culture, the use of cow dung based biogas slurry stimulates carp culture better than raw cow dung.

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WATER TREATMENT INDUSTRY

Turnover exceeds Rs. 100 crores

The industrial water treatment industry in the country has certainly come of age. It has never been more active, growth-oriented and prosperous than it is today. Its turnover amounted to Rs. 100 crores or a little more in 1989-90.

The demand for industrial water treatment plants will grow still further in view of the projected growth in fertiliser, petrochemical and chemical industries during the Eighth Plan period. The other major user of industrial water treatment plants is the power sector. Also the factor that will boost the importance of the industrial water treatment industry is the constant deterioration in the quality of raw water and its extreme scarcity, for its use in the industry in particular.

In the past, major users of water such as power stations or fertiliser plants had avoided locating themselves at places to where the total dissolved solids (TDS) in water exceeded 600 to 800 parts per million. But because of the acute shortage of suitable sites, power projects, fertiliser plants and petrochemical and chemical industries are perforce located in places where dissolved solids in raw water are in excess of one thousand to one thousand five hundred parts per million.

According to Mr. Nitin Warty, general manager of water and waste water treatment division of Thermax Ltd., in Pune, India's industrial water treatment industry has adequately responded to the requirements of the user industries by acquiring technologies for reverse osmosis and electrodialysis which can successfully use high TDS waters.

Through the acquisition of technical collaboration and through in-house research and development as also technological upgradation the important companies have introduced a number of

products and systems for the first time in the country in response to the market needs.

Mr. Warty has pointed out that the work presently carried out in the fields of reverse osmosis, development of resins, optimisation of water treatment, electrodialysis has shown that the country's industrial water treatment industry is quite competent to grapple with challenges which will be faced by its users in future.

For instance Mr. Warty says, witness the recent development in the use of non-polluting chemicals in the treatment of cooling waters. Increasing the cycles of concentration and hence reducing the amount of water wastages has been the response of the country's industrial water treatment industry, giving its users the choice of effective and non-polluting cooling water chemicals as their counterparts in the developed countries have.

The paramount role played by the industrial water treatment industry is best illustrated by its effective treatment of effluents generated by the industry. Since the basics of water pre-treatment and post-treatment of liquids are very similar, most of the major players in the industrial water treatment industry have prospects in the rising demand for effluent treatment plants and systems.

In effluent treatment, the older companies had been typically civil contractors who started with public health engineering jobs and marginally diversified into simpler effluent treatment. A number of such companies are still active suppliers in the effluent treatment market, especially where large civil work is involved, Gannon Dunkerley, Geo Miller. But the pioneer in industrial effluent treatment has been Hindustan Dorr Oliver followed by Thermax Ltd., Ion Exchange, Paramount Pollution Control and many others.

The industrial water treatment industry is dominated by Thermax Ltd. and Ion Exchange. In addition, there are Driplex in Delhi, Watco Systems in Bombay and Gaco Systems in Pune. Thermax Ltd., and Ion Exchange account for thirty per cent each of the total business.

They have a large share primarily because they have progressively upgraded their technology through inhouse research and development through foreign collaboration. Secondly and more important, as most of the work is of project nature, the major companies have been able to remain in the business because of their successful project management.

Besides the major companies, there are eight to ten suppliers of industrial water treatment plants and systems in the unorganised sector in each region of the country. The main barrier for a new entrant in the industrial water treatment industry does not appear to be technology which is presently used either for the process or engineering point of view. The main difficulty is their inability to manage projects. This is evident from the repeated emergence and closure of a large number of companies in this field.

GANESH BENZOPLAST

Ganesh Benzoplast has fared well during the six months ended September 1990, on a turnover of Rs. 4.25 crores (Rs. 2.17 crores), the company earned a gross profit of Rs. 77.95 lakhs (Rs. 44.17 lakhs). After providing Rs. 14.37 lakhs (Rs. 14.35 lakhs) depreciation and Rs. 3 lakhs (nil) taxation, the net profit stands at Rs. 60.58 lakhs (Rs. 29.82 lakhs).

The expansion project of the company for the manufacture of benzoin acid and sodium benzoate (3,600 tonnes per annum) is progressing well. The cost of the project is being met through internal accruals and borrowings from financial institutions.

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GSFC to invest Rs. 1,800 crores more on expansion

Gujarat State Fertilisers Co. Ltd. (GSFC) will additionally invest Rs. 1,800 crores in the coming five years for expanding its production capacity of caprolactam, melamine, ammonia and phosphoric acid. The object is to bring about a balanced growth of 50 per cent industrial products and 50 per cent fertilisers so that the company maintains its profitability, according to the general manager of GSFC Mr. S.R. Mody. Speaking to reporters at Pune, Mr. Modi also disclosed that the company's turnover at the end of March 31, 1990 was expected to cross the Rs. 1,000-crore mark. At the end of March 31, 1991, it would be Rs. 750 crores.

The expansion plans envisaged the increasing of the production capacity of caprolactam from 20,000 tonnes per annum at the existing level to 50,000 tonnes, involving a capital investment

of Rs. 800 crores. The GSFC's melamine output would be doubled to 10,000 tonnes by investing an additional Rs. 100 crores. The production capacity of ammonia, which is at present 1,000 tonnes per day, would be increased to 1,350 tonnes per day, by investing an additional Rs. 300 crores. The company had decided to put up a new Rs. 300 crore phosphoric acid plant for restarting its diammonium phosphate plant located at port-town Sikka in Gujarat.

Mr. Mody said the acceptance of GSFC products such as caprolactam, melamine, nylon-6, argon gas and acrylic, used as raw materials by industries, increased manifold in Maharashtra in terms of tonnage and value over the past few years. The sales value of different products, except caprolactam, distributed in Maharashtra in 1989-90 amounted to Rs. 22 crore against the

expected distribution of Rs. 30 crore in the current year, which would show an average growth of about 36 per cent over the previous year.

Similarly, Mr. Modi said, the value of these products in Pune region comprising districts of Pune, Ahmednagar and Aurangabad was Rs. 3.20 crores in 1989-90 against the expected distribution of Rs. 5.00 crore in 1990-91, working to a growth of about 56 per cent over the last year. GSFC's sale of caprolactam in the Pune region in 1990-91 amounted to Rs. 1.50 crores. The marketing trends, Mr. Modi put it, showed that GSFC would play an expanding role by distributing more of its raw materials in Maharashtra, after completion of its expansion plans over the next five years.

GSFC has performed very well in the period ended September 30, 1990 with its turnover reaching Rs. 306 crores against Rs. 306 crores in the corresponding six months in the previous year. The gross profit rose to Rs. 40.05 crores (Rs. 40.05 crores) and the profit has been Rs. 37 crores (Rs. 37 crores).

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**Rs. 15-CRORE MFL ORDER FOR
NUCHEM**

Nuchem Wier has recently placed an order worth Rs. 15 crores from Maharashtra Fertilisers Ltd. (MFL) for setting up a 2.7 million gallons per day treated sewage-based reverse osmosis system. According to a company spokesman, MFL consumed about four million litres of water per day for its operations. The water has so far been sourced from deep borewells operated by the Madras Metropolitan Water and Sewerage Board (MMWSB). In the recent years this has been hampered by water scarcity and droughts. As a dying alternative source of water supply to the plant, MFL has decided for utilisation of secondary treated sewage available at MMWSB treatment facility at Kodungaiyur by incorporating



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Gas price hike may push up fertiliser subsidy bill

The proposed increase in gas prices for fertiliser units alone will inflate the subsidy bill by over Rs. 2,000 crores by 1993-94. Expressing concern over the "arbitrary" terms and conditions offered by the Gas Authority of India and the Department of Petroleum and Natural Gas, the Fertiliser Association of India (FAI) has reiterated the need for a realistic pricing formula without adversely affecting the health of the industry. The association is also worried over the new gas use policy, which favours use of gas for power generation.

The Department of Petroleum and Natural Gas, while rejecting the recommendations of the Kelkar Committee, has suggested a much higher price of Rs. 2,500 per thousand cubic metres at landfall point and a transportation cost of Rs. 1,219 (against Rs. 850 at present). The acceptance of the Kelkar Committee report would have meant an additional subsidy of Rs. 700 crores on projected urea production up to March 1993 and thereafter about Rs. 440 crores in 1993-94. But as per the new formula suggested by the department, the subsidy for 1993-94 would go up to Rs. 920 crores.

Nearly 41 per cent of the installed fer-

tiliser capacity is based on gas. Regarding the tightening global demand-supply balance, the FAI points out that the 25 per cent Gulf surcharge would mean an additional subsidy outgo of Rs. 165 crores. Likewise, the 7.5 per cent surcharge on corporate tax will also lead to an increase in subsidy expenditure as the pre-tax return under the pricing scheme is revised upwards to avoid erosion of profitability. The association regrets that while the exchequer is not expected to get any additional resources, the fertiliser industry may run into liquidity problems.

The adverse impact of Gulf crisis is not only in the short-run but also has long-term implications. Supplies of ammonia, urea and sulphur have already been cut-off from Iraq and Kuwait. Ammonia supplies from other producers in Bahrain, Saudi Arabia and other locations are also likely to be affected in the current year.

HYDROGEN FUELLED MOTOR-CYCLE DEVELOPED

Scientists at the Banaras Hindu University (BHU) have developed a 'hydrogen fuelled motor cycle' to overcome the oil crisis.

A demonstration of the hydrogen fuelled motor cycle (1000 cc 4 stroke) covering a distance of 25 kms, was given at Varanasi on November 25, in the presence of several scientists attending the one-day workshop on 'energy crisis and hydrogen'.

THIRUMALAI CHEMICALS

Thirumalai Chemicals has turned in good results during the six months ended September 1990. The gross profit has more than doubled to Rs. 19 lakhs from Rs. 65 lakhs in the same period last year following a quantum jump in net sales to Rs. 21.09 crore from Rs. 11.67 crores. The net profit also soared to Rs. 122 lakhs during the period from Rs. 48 lakhs after provision for depreciation (Rs. 72 lakhs against Rs. 48 lakhs).

GENETIC VACCINE TO PREVENT PREGNANCY

Scientists in New Delhi have produced the world's first genetically engineered vaccine to prevent pregnancy, it was announced at New Delhi on November 29 by the World Health Organisation. Dr. J. Srinivasan of the National Institute of Immunology said the vaccine has successfully been tested on monkeys and could emerge as a cheap anti-fertility vaccine for humans.

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IBHCO secures Plan panel approval for Rs. 1,214-crore projects

Krishak Bharati Cooperative has been given the go-ahead by the Planning Commission to set up three projects worth Rs. 1,214 during the Eighth Plan. The clear-comes after KRIBHCO was by Abhey Oswal in the race for Rs. 694-crore gas-based fertiliser at Shahjahanpur in Uttar Pradesh. IBHCO has been allocated a mere Rs. 100 crore for each project by the Plan-Commission, which means that it has to generate funds internally. This did not pose a problem, as the cooperative already has a surplus fund of Rs. 200 crores. It is expected to generate another Rs. 200 crores in the Eighth period.

The cooperative made a net profit of Rs. 101 crores in 1989-90, which is estimated to reach Rs. 108 crores in the next year. Fertiliser industry sources say KRIBHCO was the most qualified to set up the Shahjahanpur project. It had to bag this prestigious project when it bid Rs. 698 crores against the state's Rs. 695 crores. Oswal had also made a commitment that there would be no cost escalation.

The go-ahead for the new project is expected to provide a boost to the cooperative. However, the KRIBHCO management is keeping its fingers crossed. "There is many a slip between cup and the lip", said a senior executive. KRIBHCO runs the biggest fertiliser plant in the world in the cooperative sector at Hazira in Gujarat. The plant has a production capacity of 100 tonnes of ammonia and 4,400 tonnes of urea per day. The capacity utilisation, according to KRIBHCO, is 120 per cent.

**AGARJUNA FERTILISERS:
MUTUAL FUNDS MAY HAVE
5% EQUITY**

Mutual funds are expected to have

nearly 12 per cent equity stake in the Nagarjuna Fertilisers and Chemicals Limited which is setting up a Rs. 785-crore gas-based fertiliser project at Kakkinada in Andhra Pradesh. Nagarjuna Fertilisers is planning to enter the capital market in January next with a public offer for Rs. 108 crores at par to finance the project which is expected to be commissioned in August 1991. Of the public offer, shares for nearly Rs. 10 crores will be reserved for mutual funds which are also contributing Rs. 14 crores towards promoters equity. Thus, the total equity contribution by mutual funds would amount to Rs. 23 crores and account for 12 per cent of the total equity capital of Rs. 196 crores.

The Andhra Pradesh government is contributing Rs. 13.5 crores and KRIBHCO Rs. 10 crores towards the promoters equity of Rs. 88 crores of

Nagarjuna Fertilizers, which has been promoted by the Nagarjuna group. Snamprogetti of Italy, which is providing technology, is also acquiring equity shares for Rs. 4 crores out of the promoters equity. Of the public issue, quota for Rs. 9 crores has been reserved for NRIs.

According to Mr. K.V.K. Raju, managing director, the company will have a ready market for its fertilisers in the state which consumes about 1.6 million tonnes of urea per annum. The company has already marketed, under its market seeding programme, through the wide distinction network of 2,500 dealers, over one million tonnes of urea in Andhra Pradesh and adjoining areas. Mr. Raju disclosed that the company has already committed funds totalling over Rs. 700 crores of the total project cost of Rs. 785 crores. It has spent nearly Rs. 525 crores so far on acquiring plant and machinery and other assets.

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Tamil Nadu plans joint venture company for lignite exploration

Tamil Nadu government plans to float a joint sector venture to exploit the large lignite potential in Jayakondam area in South Arcot district for power generation, the state chief secretary Mr. M.M. Rajendran said at Madras on November 24.

The lignite potential is estimated to be over 1,000 million tonnes and the area is not reserved for the public sector Neyveli Lignite Corporation (NLC), he said inaugurating a seminar on capital markets and Tamil Nadu companies organised by the Confederation of Engineering Industry (CEI).

Recounting the attractive package of incentives offered in the state and also the availability of a sound infrastructure and good industrial relations, he asked the entrepreneurs to avoid starting power-intensive industries. The present

30 per cent power cut on HT units would be relaxed once the coal supply to the thermal plants improved, he added.

Mr. Rajendran and Mr. E.R. Krishnamurthy, advisor to the Madras Stock Exchange referred to the phenomenal growth in the capital market and urged the companies in Tamil Nadu to take advantage of the boom by shedding their conservatism and reluctance to risk taking.

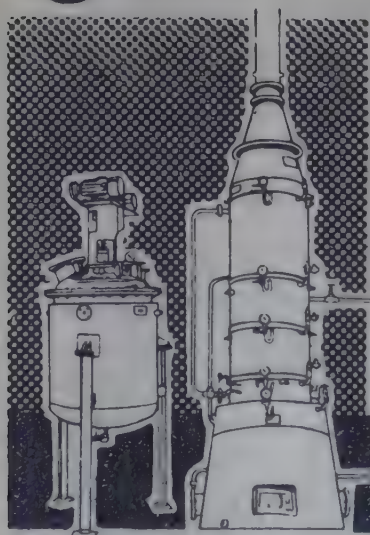
Mr. Krishnamurthy was optimistic about exceeding the level of Rs. 50,000 crore expected to be mobilised by the primary market during the Eighth Plan end. He wanted the Union government to abolish the tax on dividend income of the shareholders in order to attract more investors to the market. Mr. R. Viswanathan, managing director of SBI

Capital Markets said the m have already mobilised over crores this year against Rs. 5 last year.

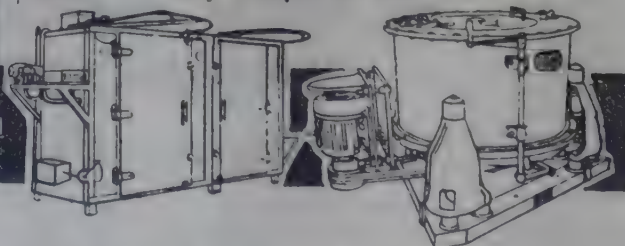
The Over the Trade Coun exchange has already co Bombay and is expected to rations from January. It is s big success and help the sm nies to have access to the cap It is also expected to develop of market makers, he said.

Mr. S. Ramanathan, execu tor of MSE said the Union g has cleared in principle the of a stock exchange at Coim it is expected to commence middle of the next year after ognition. Mr. T. Anantha convenor, taxation and fina Tamil Nadu committee said nar is intended to help the in the state to take stock of ing trends in the capital mark of the opportunities by intera the brokers from Bombay, bankers and stock exchangin ties.

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Kerala ties up with Thapar group to make cyolite

The Kerala government has decided to tie up with the Thapar group to manufacture cyolite required for making detergents and other similar chemical products in bulk quantities. The government-owned Kerala State Industries Development Corporation (KSIDC) has signed a memorandum of understanding with the Thapar-owned Parat Starch Company to launch a Rs. 50 crore joint sector venture for the purpose.

The BSC vice-president, Mr. S.N. Nair, after signing the MoU, said the Thapars' investment in the project would be 26 per cent of the total equity, whereas the state government promotional body would hold 25 per cent of the shares. The KSIDC managing director, Mr. M.K. Ravindranath, said the participation of the public and the financial institutions would be ensured in the

new project which will go on stream within a year.

The Thapars already own the English Indian Clays Limited in Thiruvananthapuram and have developed the technology required for manufacture of cyolite based on the rich clay deposits in the state with the aid of the Regional Research Laboratory of the Council for Scientific and Industrial Research. Earlier, Thapars had staked a claim to take over and modernise the ailing Titanium projects run by the state government with little flourish and then opted out.

RECESSION IN FERRO ALLOY INDUSTRY

Elkem of Norway, one of the foremost producers and exporters of ferro alloys in the world, has suffered a loss in its operations during three quarters of

1990. The loss is Kroners 1,030 million in the corresponding period of last year. The steep fall in profit is due to the decline in the prices of ferrosilicon and silicon metal as also lower production, due to poorer sales.

The flood of cheap supplies from China and the USSR has cut into the market. Elkem feels that there will be no improvement in the position for sometime due to emerging steel recession as also due to the Gulf crisis. Elkem therefore has cut down production of both ferrosilicon and silicon metal by 10 to 20 per cent and these cuts are likely to continue.

Meanwhile, Japanese ferro alloy producers are reportedly contemplating action against dumping of silico manganese and ferro manganese by certain exporters. Dumping action is also being contemplated by the European ferro chrome producers against Albania and the USSR.



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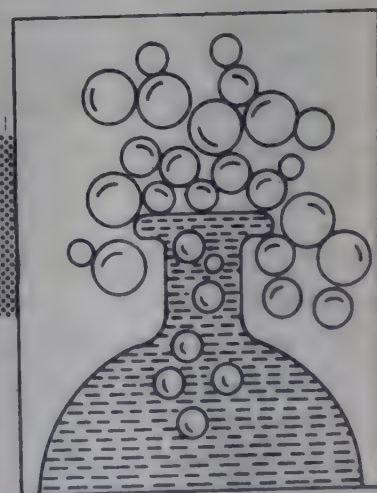


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CCS, duty drawback rates hike sought

Exporters have demanded an increase ranging from 10 per cent to 25 per cent in cash compensatory support (CCS) and duty drawback rates to offset the 25 per cent increase in the prices of petroleum products. The exporters have not been compensated for the higher prices of diesel and the relief through incentives would help increase exports, particularly to hard currency areas, they contend.

In a detailed paper submitted to the Commerce Ministry, Mr. Ramu S. Deora, president, Federation of Indian Export Organisations (FIEO), has urged the ministry to drastically cut down the time gap in policy announcements and their implementation. A number of exporters have written to FIEO pointing to the delays. This adversely affects them because they are not able to quote competitive prices, they say.

In view of the deteriorating balance-of-payments position, with growth in imports outpacing that of exports in the first six months of the current financial year, it is imperative to give a push to exports without any delay. The exports have shown an increase of only 22 per cent in April-September 1990, which is none-too-encouraging, it has been pointed out.

The FIEO chief has also urged the government to improve infrastructural facilities like communications, warehousing and transportation of export cargo. Since the last few months of a year are crucial for maximising exports, inadequate space at airports and ports have created difficulties, particularly for textiles, handicrafts and leather products, he has argued.

He has pleaded that the new government should do everything possible by not only maintaining the present structure of assistance and facilities for exporters, but also improving upon them. It is equally important to introduce greater liberalisation and simpli-

fication of procedures and provisions, Mr. Deora has emphasised.

This is the only way that the new government can ensure for the country adequate returns in terms of foreign exchange for its economic viability, the FIEO chief has said. Moreover, exporters have demanded that the validity period of import licences be extended to two years. This would help them to stagger their imports and also, as a consequence, reduce the pressure on scarce foreign exchange resources.

Also, it is imperative that the government implement the industrial policy which raised the investment limit for the small-scale sector. This is the need of the hour as small-scale manufacturers and exporters contribute more than 50 per cent of the country's total exports. To curb the mounting import bill, the government has done well to allow imports of certain raw materials only through rep and additional licences, he stated.

Mr. Deora has pointed out that any industry which can arrange its own foreign exchange to import plant and machinery without any disclaimer, including arrangements with non-resident Indians, should be allowed to do so. Also, the concessional duty of 25 per cent may be made applicable to such imports with the condition that it should be paid in foreign exchange.

CUSTOMS VALUATION RULE AMENDED

The government has amended provisions of the Customs Valuation (Determination of Price of Imported Goods) Rules, 1988 to eliminate under-invoicing by importers.

An importer or his agent, is now required to furnish the invoice of the manufacturer of the goods whenever the goods are imported through a person

other than the original producer.

This has been done to deter people from quoting a lower value to avoid taxes. It has been found that when people purchase goods from a person other than the manufacturer, there is a tendency to under invoice the value of the goods. These provisions come in effect from October 31, 1990.

LEAD ACID BATTERY UNIT NEAR TIRUPATI

Amara Raja Batteries (ARB) will be the latest entrant in the lead acid battery manufacturing sector. Its entry will be with a marked difference with other existing manufacturers. Ushering in sealed maintenance-free batteries for the first time in India, the company is setting off a revolution that could well be the "beginning of the end of the battery era", according to Mr. G. Gemgulu N. Galla, Managing Director.

The company will use state-of-the-art technology of GMB Inc. of the US to make the sealed maintenance-free (SMF) battery range.

The Rs. 19.20 crore project is at an advanced stage of implementation at Karakambadi near Tirupati. The installed capacity of the project is one lakh batteries per annum.

To part-finance the project, the company proposes to enter the market shortly with a public issue of 33 lakh equity shares of Rs. 10 each, aggregating Rs. 330 lakhs. The private promoter, Mr. Ramachandra N. Galla, an NRI technocrat, having wide experience in power systems as an electrical engineer in nuclear and conventional source power generating stations across the US, proposes to take an equity stake of Rs. 197 lakhs. The Andhra Pradesh Industrial Development Corporation will provide Rs. 58 lakhs, SBI Mutual Fund Rs. 40 lakhs, LIC Mutual Fund Rs. 20 lakhs and Canbank Mutual Fund Rs. 25 lakhs.

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KMML sells 'tickle' to overcome financial crisis

The Kerala government-owned Kerala Minerals and Metals Ltd. (KMML), based at Chavara near Quilon has begun sale of tickle (titanium tetrachloride) to overcome the financial crisis caused by the stagnation in marketing of its finished product, titanium dioxide, an important raw material for the paint industry. KMML general manager (finance) K.M. Ramanunni said that plans were also afoot to sell oxygen to overcome its financial crisis.

stock of 1,800 tonnes of titanium dioxide, worth Rs. 14 crores. Titanium dioxide is now available in the Indian market at low prices because of the Union government's decision in June this year to liberalise its import under the open general licence and reduce its import duty from 131 per cent to 85 per cent.

This was done because KMML, the sole producer of upgraded titanium dioxide, could not meet the demand due to technical reasons. But the liberalisation was subject to the condition that the paint industries purchased titanium dioxide from KMML when stocks were available. Mr. Ramanunni said the Indian Paint Association (IPA) had not kept its promise to the government and KMML regarding offtake of titanium dioxide. On a complaint from KMML to the Union industries department, the IPA once again assured that it would

help in the liquidity of the stock of titanium dioxide with KMML. Yet the take position had not improved. The sale of titanium dioxide stood at 1,800 tonnes in August, increased to 2,100 tonnes in September and then declined to 314 tonnes in October. Ramanunni said the KMML now could provide an assured supply of titanium dioxide to consumers, as it had overcome its financial problems.

INSURANCE CLAIMS ON EXPORTS TO GULF GO UP

Insurance claims on account of the commodity and project exports to Iraq as well as to Kuwait following the recent military build-up in the Gulf have been mounting day by day, according to Export Credit Guarantee Corporation (ECGC). Claims lodged against defaults recorded together with the claims in respect of Iraq for short-term (i.e. commodities supplied) exports worth Rs. 9.83 crores and the claims against Kuwait to Rs. 16 crores in a few days, according to sources. Of this sum, it was learnt that claims made by TISCO were about Rs. 9 crores.

While these fresh claims are being processed, ECGC has already claims worth Rs. 7.62 crores lodged with it, including a claim worth Rs. 6.6 crores by Zenith Ltd. A small portion of Zenith's total exports worth Rs. 36 crores in 1989-90 was for Iraq and had the credit insurance cover by ECGC for a maximum liability of Rs. 49 crores. The claims made against ECGC in respect of long-term (i.e., projects) have reached a staggering sum of Rs. 49.04 crores by September 21. While these fresh claims are being looked into, ECGC settled claims worth Rs. 27.92 crores in respect of guarantees to commercial exporters extended for project exports to Iraq. Insurance claims on ECGC in respect of commodity exports to Kuwait swelled to Rs. 3.96 crores, and project exports to that country to Rs. 5.64 crores.

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SAIL draws up Rs. 600 crores pollution control scheme

Steel Authority of India Limited (SAIL) has chalked out a Rs. 600 crore pollution control programme. This is part of SAIL's ongoing technological upgradation works at all its steel plants.

The programme envisages phasing out of the existing highly pollution causing processes and plants like open hearth steel making and desiliconising.

SAIL has adopted a two-tier organisational structure to tackle the situation at the corporate and plant levels. They have set up a central environmental management division at the apex level and environmental control department at the plant level.

The idea is to develop technical expertise and data base and ensure that all new projects have adequate inbuilt pollution safeguards.

A fully equipped modern laboratory has been set up at the R&D centre for iron and steel at Ranchi for specialised studies in pollution control. The World Bank is assisting SAIL in undertaking a detailed study in this area.

SAIL has already engaged the Australian companies, BHPV/Kin Hill, with the World Bank-funded study at a cost of \$3.3 million.

The study is expected to be completed next month. It aims at incorporating state-of-art environmental monitoring facilities at SAIL plants, assessing the pollution levels and recommending remedial measures and involving training plans for SAIL personnel in the area of environmental control.

Monitoring equipment worth \$2.8 million are being installed while action plans have been drawn up to implement

various other schemes during the revamp of existing facilities in plants.

The cost of implementation of 50 such schemes, which are already underway, is Rs. 160 crore. They will be completed by the end of 1992.

Also, there are 41 such schemes, requiring an investment of Rs. 250 crore that have been identified by SAIL and are at the various stages of approval. Subject to their timely clearance by the government, these schemes would be operational by 1995-end.

A SAIL press release claims that once these schemes are fully implemented, its steel plants will reach international standards in pollution control.

This is the most expensive pollution control programme to be undertaken by

any industrial corporation in the country.

BAYER (INDIA)

Bayer India has produced satisfactory results during the six-month period ended September, 1990. The turnover is up by 11.8 per cent to Rs. 87.72 crores from that of the same period last year. The gross profit stands at Rs. 8.74 crores against Rs. 7.83 crores showing an increase of 11.6 per cent.

The profit has edged up by 3.9 per cent to Rs. 3.95 crores from Rs. 3.80 crores after depreciation (Rs. 1.89 crores against Rs. 1.28 crores) and taxation (Rs. 2.90 crores against Rs. 2.75 crores).

The company has invested about Rs. 3 crores on pollution control on a recurring basis during 1989-90 and more investments will be forthcoming during the current year.

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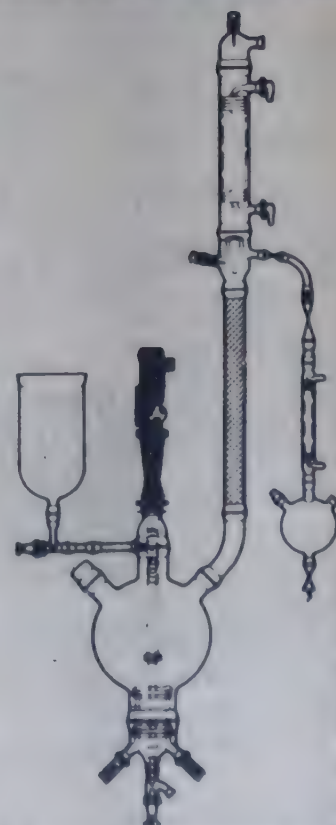
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National plan to combat pollution

The Government of India as drawn up an ambitious National Pollution Control Plan envisaging what is described as a countrywide "security umbrella" against pollution. In this regard the Government, after consultations with the States, has also prepared a list of critical areas to be covered by the plan.

These are: Chembur in Bombay (Maharashtra), Vapi (Gujarat), Pali (Rajasthan), Gobindgarh (Punjab), Singrauli (Uttar Pradesh), Dhanbad (Bihar), Digboi (Assam), Durgapur and Howrah (West Bengal), Talcher (Orissa), Korba (Madhya Pradesh), Visakhapatnam (Andhra Pradesh), Mangalore (Karnataka), Udyogamandal (Kerala), and Manali and North Arcot (Tamil Nadu).

However, World Bank assistance is considered necessary — and is being sought — for effective implementation of the measures against pollution con-

templated on such a massive nationwide scale for the first time.

Pollution at hazardous levels can take place in land, water and air, and in fact it has so taken place in most parts of the world, including India. Pollution of the atmosphere is caused chiefly by industries, specifically thermal power stations, iron and steel plants, fertilizer units, copper and aluminium smelters, and oil refineries.

Others contributing to pollution are pulp and paper, basic drugs, dyes, petrochemicals, pharmaceuticals, sugar mills and tanneries.

Major pollutants include lead, mercury, pesticides, carbon monoxide, sulphur dioxide and asbestos. Wide stretches of a number of rivers in India have been vitiated owing to introduction of these toxic matters in their systems. These include Sutlej, Ganga and its trib-

utaries, Chambal, Gomti, Subarnarekha, Damodar, Godavari, Krishna and Sarmati.

Despite the Environment (Protection) Act, 1986, and the creation of Central and State pollution boards, there is still virtually no control over industries, both in the public and private sector as well as those owned by multinational corporations, spewing toxic wastes into the atmosphere, water sources and food production.

The country has still not recovered from the unprecedented tragedy caused by the leakage of poisonous chemicals from the Union Carbide plant at Bhopal six years ago, which took a toll of over 2,000 lives and maimed, blinded or otherwise incapacitated thousands more.

The world ecology (inter-relationships of organisms and their environment) was introduced into the scientific lexicon by Ernst Haeckel, a German biologist some 118 years ago. That was the first sign of an awareness that all components of nature are interwoven closely, and that man too belongs to this large pattern.

However, the movement launched for a clean environment and ecological equilibrium is only two decades old and it may take several years before official agencies and environmental groups like the Chipko Movement and the Kerala Sahitya Parishad (that protested against the Silent Valley project) could get together under a common banner to save the environment. It would be rather foolhardy to formulate a plan of action in the wake of an ecological disaster and forget about it when things have cooled down.

For instance, even before the former Prime Minister Indira Gandhi addressed the first UN Conference on Environment in Stockholm in 1972, a section of river Ganga became ablaze near Monghyr in Bihar owing to the discharge of oil with effluents from

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Oil Refinery, which had caught quite often ecological problems from the rapid growth of industries discharge waste material into the river and land areas, treating as regular junkyards.

In the seventies, an estuary near Goa witnessed large-scale destruction of life on account of water contamination. Ammonia and arsenic chemicals were discharged from a nitrogenous fertilizer factory in the vicinity. Similarly, the river Damodar is constantly polluted by steel and chemical industries in the region.

India's thermal power plants spew millions of tonnes of fly-ash that contain heavy metals such as zinc, lead, and copper. Their dumping ponds usually constitute slurry ponds in rural areas. The supernatant liquid seeps into adjoining water courses. When used in low-lying areas, the leachate percolates into ground water.

There are certain pesticide factories that collect concentrated and toxic solid sludge in containers and bury them in pits within the industry's premises. Improper disposal of waste material is likely to result in the pollution of ground water. Tonnes of chemical dyes are produced in the country each day. As many as 39 organic chemicals, heavy metals and their salts, acids and alkalies are used in the manufacturing units.

When the waste gets released in small quantities into the filter cakes while sludges are formed as a result of setting and neutralisation of waste waters. Some of the organic compounds are highly toxic and fatal. Incidents of bladder cancer, particularly among those working in aromatic amine conditions are frequently reported. The Kali river near Kalyan in Bombay, some years ago, faced such a catastrophe when the discharge of untreated waste from dye industries was seen floating in the water.

Forests along the Kerala-Tamil Nadu

border are fast deteriorating due to pollution spewing from cement factories. The Environment (Protection) Act, 1986 attempts to provide a comprehensive law on environment and goes beyond the scope of legislation on water and air pollution, passed in 1974 and 1981 respectively.

Since, environment has been defined to include among other factors the inter-relationship between nature and human beings, it covers a far broader area than pollution. However, in the context of the laws framed to curb pollution, the recent decision to have a National Pollution Control Plan could hopefully serve as a comprehensive shield against industrial pollution.

R&D AWARDS FOR 12 COMPANIES

The department of scientific and industrial research (DSIR) has selected 12 companies for presenting national

awards for best in-house R&D efforts in seven areas. In the chemicals sector, the award winners are, Malladi Drugs and Pharmaceuticals and Polychem.

In the electricals sector, Larsen and Toubro and High Energy Batteries (India) Limited have been selected for the awards, whereas Marine Communication Electronics and V. Automat and Instruments have won the awards in electronics sector.

The other winners are, HMT in the mechanical sector, Tata Iron and Steel in the processing sector, Venco Research and Breeding Farm and Pioneer Seed Company in the agro sector and National Organic Chemical Industries and Renewable Energy Systems for successful commercialisation of public-funded technology development.

DSIR instituted these awards in 1987 to give recognition to in-house R&D achievements of the corporate sector.

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Pollution busters head for the East

Dire warnings have been given by Chris Pattern, the UK environment secretary, that British exporters could lose out to foreign competitors in the race to capture overseas markets for pollution control equipment.

Britain is in danger of lagging behind in eastern Europe where the market for equipment to clean up the environmental devastation left by the communist regimes is estimated at about £8 bn a year. The hesitancy is understandable. There is shortage of hard currency available to pay for contracts, and legal and commercial confusion during the transition to a free market will remain for some time. Deals were previously concluded with state trading organisations but western businessmen are now faced with a variety of independent organisations and burgeoning companies.

"It is no good relying on out of date information about these countries", says Max Hobbs, group marketing director of Institutform Services. "You have to get your wellies on and go out there". His company, which manufactures a new system for repairing pipelines has already started to penetrate eastern Europe. At the International Environmental Engineering Exhibition in Brno, Czechoslovakia last month Hobbs was

swamped with enquiries.

The company has just repaired two pipelines under Vitava river in Prague which were causing pollution. Under the Institutform system a cylinder is inserted in the damaged pipe and expanded to provide a new lining. The company is now negotiating for a job on sewer pipes at Moscow State University.

Chris Salter, a director of Just Water, a West Lothian company producing water purification equipment, was surprised at the interest shown in Czechoslovakia. On the first day at Brno he had 50 enquiries. He was interviewed on local radio and his product appeared on the TV news.

The extent of water pollution in Czechoslovakia was clear in Brno itself. Till recently ago residents of this heavily industrialised town were being warned not to drink the water without boiling it. One of the main needs in eastern Europe is for pollution monitoring equipment. The technology is not available there for measuring pollution let alone dealing with it.

Openings exist for companies such as VG Instruments, a division of Fisons, which was at Brno with its selling agents Uni-Export Instruments. It pro-

vides a whole range of instruments detecting toxic gas, minute quantities of lead or mercury, impurities in drinking water or applications for soil analysis.

It is not a market for fly-by-night who come in to make a quick sale. Servicing of equipment is important and the company has service arms in Czechoslovakia and other countries in the region. The need to think long term is stressed by Jan Campbell, chairman and chief executive of Campbell Cocept of Weybridge, Surrey, which specialises in development and investment opportunities in eastern Europe.

Campbell is dealing with a project where the Czechs have developed technology for turning ash into artificial stones. The Czech sponsors are putting up half the money but need a further £100,000 from the West. The Czechs face vast environmental problems. Tall chimneys belch smoke from the sulphurous brown coal which causes acid rain. In Northern Bohemia near the German frontier whole areas of forest had been badly damaged by acid rain.

Bedrich Moldan, environment minister for the Czech Republic emphasises that he would like British companies to establish joint ventures with the Czechs to tackle these problems.

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PACKAGE TO BAIL OUT ECONOMY

Govt. seeks oil on credit terms from Malaysia, Venezuela

The Union government is understood to have approached Malaysia and Venezuela to get "oil-credit" from them to finance its rising petroleum imports. The move is part of a package of measures being finalised to bail the economy out of the present balance of payments (BoP) crisis.

Other steps in the package are to seek special assistance from friendly countries like Japan and Germany, tap the oil rich countries like the United Arab Emirates (UAE) and Iran and mobilise deposits from the non-resident Indians (NRIs) in a big way.

The government has also kept open the option for seeking a loan from the International Monetary Fund (IMF). A decision on this has to be taken at the political level.

In addition, special steps are being taken to earn more foreign exchange through higher exports and to regulate imports to reduce foreign exchange outgo.

Official sources declined to indicate the likely amount of foreign exchange assistance the government hopes to raise with the help of this package. But going by the impact of the Gulf crisis on the economy, estimated at \$2.8 billion, the government would not be content with anything less than \$3 billion.

The various options and the package to bail out the economy were also discussed at a meeting recently, when senior secretaries briefed the Prime Minister, Mr. Chandra Shekhar, about the magnitude of the BoP crisis.

According to reliable sources, detailed negotiations with Venezuela and Malaysia are expected to be held soon. The objective is to import oil from these countries on credit. This will enable

India to meet its rising oil import bill without further drawing down its already low foreign exchange reserves.

The amount of credit from the two countries would depend on the quantity of oil they agree to give to India. There is a general consensus in the government that no shortage in petroleum products should be allowed to be created now, which will affect the economy's growth.

Thus, the new government is not hesitating to take a decision on importing more oil products whenever there is a shortage in the domestic market.

Government officials are also holding discussions with representatives of the Japanese and German governments to explore the possibility of their extending assistance to India. Government officials at New Delhi discussed the question of credit with the visiting deputy minister of foreign affairs, Mr. K. Watanabe.

The Indian High Commission in the United Kingdom has also been asked to start negotiations with the governments of UAE and Iran to see if these countries could provide credit at a short notice.

These directives have gone after the UAE has responded positively to initial Indian overtures on this issue.

In fact, other countries in the Gulf including Bahrain and Qatar will also be tapped by India under the proposed package. It is pointed out that these countries have accumulated huge surplus funds following the hike in oil prices. These funds are now available for lending.

The governments attempt to raise deposits from NRIs has already met

with partial success. The second series NRI bonds, floated by the SBI Capital Markets Limited from November 1, 1990, has already been able to raise over \$250 million, according to reports.

The issue will close on December 31, 1990 and may raise more foreign exchange deposits for the country. More incentives may also be given to attract NRI deposits.

The government has now decided to set up a co-ordination committee to receive suggestions and have a dialogue with various NRI organisations. The committee will sort out any problem that might arise in the implementation of government decisions pertaining to NRIs.

The committee would be in addition to the already existing NRI consultative committee, which is a forum for interaction between the NRIs, banks and financial institutions.

The new committee will be headed by an additional secretary in the department of economic affairs and will include representatives from ministries of commerce, external affairs, industry and environment.

The government has also decided that the Abu Dhabi office of the Indian Investment Centre (IIC) will continue to function for some more time till the situation there stabilises. This decision has been taken in view of the problems of NRIs following the Gulf crisis and in response to their requests.

Earlier, the government had decided to close down all foreign offices of IIC as part of an economy drive. The latest foreign exchange reserves are estimated at Rs. 3,085 crores, which are just enough to meet one month's imports. It is because of such a low level of foreign exchange reserves that the government has planned this package and clamped down on imports and is taking steps to boost exports.

WB aid sought for Rs. 500 crore environ. project

A World Bank team was in Bombay on November 30, to negotiate terms for a line of credit for a Rs. 500 crore project to improve pollution control measures in industry and strengthen the environment protection boards. The financial institutions have asked the World Bank to consider converting part of the loan into a grant.

The project involves setting up effluent treatment facilities in industrial towns like Vapi in Gujarat and improving pollution control measures in industries like chemicals, dyes and dyestuffs, fertilisers, leather and textiles. The World Bank has been approached for a loan to finance this project. The funds will be channelised through the Industrial Development Bank of India (IDBI).

The financial institutions have sought a World Bank aid for strengthening the administrative facilities of the environment protection boards at the centre and the states. The World Bank delegation is expected to meet officials from the ministries of finance, industry and environment shortly to fix and discuss project finance details.

The World Bank has been approached for nearly Rs. 1,800 crores. The Bank has, so far cleared cement

industry and is considering several lines of credit for the other sectors of industry. The Bank is likely to lend around Rs. 400 crores to the textile industry. Funds will be provided for modernising textile mills in the public as well as in the private sectors. The Bank is also expected to contribute to the Textile Workers Rehabilitation Fund (TWRF).

The Industrial Development Bank of India (IDBI) and the Industrial Credit and Investment Corporation of India (ICICI) had earlier approached the World Bank for financing fertiliser projects in India. The Bank however, is not keen to extend funds to a sector that is subsidised by the government.

The Rashtriya Chemicals and Fertilisers (RCF) Limited has sought World Bank aid for a newsprint project in Nigam in Maharashtra. The Bank has asked RCF to draw up a feasibility study for the project expected to cost around Rs. 460-480 crores.

The newsprint plant will be set up in collaboration with Maharashtra Sugar Mills Federation and Maharashtra Industrial Development Corpn. The MIDC has applied to the government for a letter of intent for the plant. The FIs have also sought \$200 million for installing energy saving devices in firms and

\$500 million as a general line of credit

NO CHANGE IN IMPORT LICENSING POLICY

The Government on Nov. 29 denied reports appearing in a section of the press that it had stopped issuing import licences for industrial raw materials and components till December end. An official release at New Delhi said that there had been no change in the import licensing policy. It said meetings of the headquarters and regional supplementary licensing committee were being held regularly and the last one was held on Oct. 23.

SYNTHETICS AND CHEMICALS

Synthetics and Chemicals has suffered a setback in its working results during six months period ended September, 1990. Sale of products and other income amounted to Rs. 72.25 crores against Rs. 64.41 crores same period last year and Rs. 139.77 crores last year.

It has earned a lower gross profit of Rs. 393 lakhs against Rs. 512 lakhs and Rs. 679 lakhs last year. After depreciation (Rs. 87 lakhs against Rs. 60 lakhs) and taxation (nil against Rs. 65 lakhs), the net profit amounted to Rs. 306 lakhs against Rs. 387 lakhs same period last year and Rs. 384 lakhs last year.

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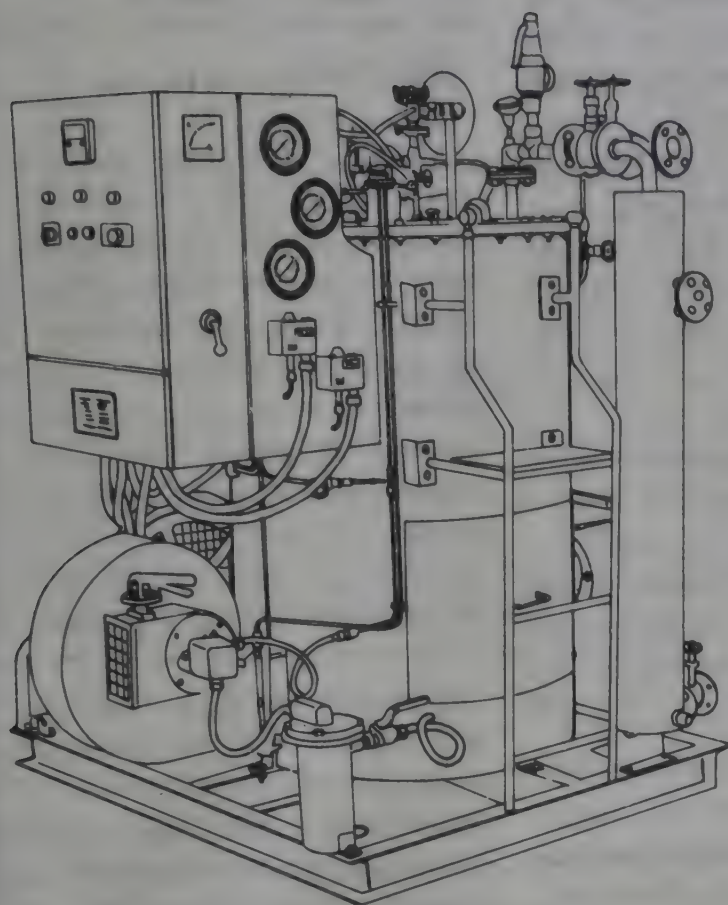
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Global environmental facility soon

The World Bank has announced the setting up of a new global environmental facility (GEF) jointly with the UN environmental programme and the UN development programme. Some 25 developed and developing countries, at a meeting in Paris agreed to contribute \$ 1 billion to \$ 1.5 billion for the facility.

The World Bank Vice-president Mr. Ernest Sternm, who chaired the meeting, said he intends to confirm the contributions from the governments in the next few weeks. The Bank will be the administrator of the facility. It expects the facility to be operational before the middle of 1991, a Bank press release said.

The facility has four broad objectives: To support conservation, the use of energy sources which will not contribute to global warming, forestry management and reforestation to absorb carbon dioxide, in order to limit the

increase in greenhouse gas emissions to preserve areas of rich ecological diversity, to protect international waters, where trans-boundary pollution has had damaging effects on water purity and the marine environment and to arrest the destruction of the ozone layer, by helping countries to make the transition from the production and use of CFCs, halons and other gases to less damaging substitutes.

To support the fourth objective countries had previously agreed to make \$ 160 million available under the Montreal Protocol. The World Bank, United Nations Environment Programme and the UN Development Programme will be the executing agencies for this ozone layer programme.

The three agencies will also implement the global environment facility. The participating countries, in regular semi-annual meetings, will provide

overall policy guidance and review the work programme.

EC PLANS TO TAX CARBON EMISSIONS

Plans to tax carbon emissions are being drawn up in Brussels as part of an ambitious EC environmental package to be unveiled shortly. Proposals for the first "green" fund financed from the EC budget, fiscal incentives to combat pollution, and an "ecolabelling" scheme for goods which meet high standards of environmental protection are among other measures being prepared. Mr. Carlo Ripa Di Meana, the EC environmental commissioner is said to be determined to win commissioner approval for the ideas which he hopes will provide the foundations of his policy for the second half of his four-year mandate. All would subsequently need member state support. Most of the issues have been under consideration for some time, but a significant spur to action was provided recently when the 18 nations of the EC and EFTA committed themselves to stabilising carbon dioxide and other greenhouse gases by the year 2000.

EC environmental experts believe introduction of an energy tax is essential if this target is to be met. They argue that the current high oil price presents an ideal opportunity. Full details of the plan have not yet been settled but one idea is that the tax would be increased as energy prices fall back closer to their pre-Gulf crisis levels. It would be related to the quantity of carbon emitted, so that for example coal would be more heavily penalised than oil, and oil would be hit harder than gas. Other internal Brussels negotiations — concerning plans for a registration tax on lorries and a variable purchase tax on cars, related to their petrol consumption — are also at a delicate stage. Officials recognise that these proposals could trespass on member states' jealously guarded sovereignty in the area of taxation.

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OTLIGHT ON

Biotechnology & Life Sciences (Part 1)

CTERIA-BLEND MARKETING R TREATING COMPLEX STE OF EFFLUENT STREAMS

A newly formed UK based bio processing company is offering industries a novel tailor-made chotch-potch of bacteria to treat complex effluent streams. Vinidian Bioprocessing, (UK) based in Whitstable, Kent, is a joint venture between engineering and development company, AMEC, Chemical and Pharmaceutical company, Rhone Poulenc and the Univ. of Kent which holds the licence for the Microbial Custom Blend process.

The Microbial Custom Blend process uses a database of several hundred different species of bacteria to find those that degrade each component of the mixture of effluents from a plant. The bacteria are then combined so that they work together to treat the complete effluent stream. Some of the bacteria are taken from the plant site itself, where they have already been feeding and breeding on effluent and so come ready designed. Many are also found at local sewage treatment works.

The company takes a holistic approach to each plant for treating the effluent. The company's spokesman said 'We find that in many cases, plants dispose of different effluents is separate streams. But these streams can sometimes be combined in such a way that they will provide all the nutrients required to sustain a mixture bacteria, which could not have survived on just one of the streams'.

The first stage in developing a bioreactor for a plant is to carry out a feasibility study, which identifies individual components of effluent and the bacteria species needed to treat them. Bacteria are tested on synthetic effluent. The second stage is to develop

a portable pilot bioreactor which can be transported to the plant and is used to treat a small quantity of effluent that is diverted to it. The third stage is to begin to build an industrial scale bioreactor, which the company is initially offered on a monthly rental basis. The company's spokesman estimates that it takes about a year to reach this point, with total costs — excluding the final bioreactor — of around £35-40,000 (\$68-79,000). Vinidian researchers are now investigating bacterial blends that will degrade the most stubborn wastes — those that are highly chlorine-substituted. The company is now drawing up proposals for 20 companies in UK, USA, France and Germany and has had enquiries from many more. (*ECN*, 10/3/90, p. 53).

GENETICALLY-ENGINEERED VIRUS UNDER FIELD TRIAL IN UK

Genetically engineered viruses that kill caterpillar pests are to be tested in an enclosed field in the UK for the first time next year. The baculovirus, designed by researchers at the Institute of Virology and Environmental Microbiology (Oxford, UK), kill caterpillar pests that affect sugar beet and cabbages. One of the two viruses to be tested contains a gene for a bacterial toxin. The residue from the virus persists to protect the plant from many different insect species. The other virus contains an insect enzyme that affects the pupation stage of caterpillar growth. Both viruses are designed to self-destruct. The trial was announced at the British Association Meeting in Swansea, Wales last August. (*ECN*, 10/3/90; p. 53).

CORN BULLETS FOR IMMUNIZING CORN AGAINST DISEASE & PESTS

Ciba-Geigy Agrochemicals has

recently announced a new genetic engineering method that could immunise commercial varieties of corn against attack from disease and pests for generations.

Researchers at Ciba Geigy call the new method Biolistics because it involves shooting minute metal particles coated with genetic molecules into plant cells at high velocity.

The researchers report that Biolistics can give genetic resistance to cereal crops, such as maize and wheat, that have been less responsive to established techniques.

However, Ciba reports that it will take eight years for engineered cereals to reach the market. (*ECN*, 10/3/90, p. 53).

A MUTANT GENE LINKED TO OSTEOARTHRITIS

A mutant gene that causes osteoarthritis has been found by biochemists and rheumatologists in USA. Osteoarthritis, also called degenerative joint disease, causes cartilage, the tissue that covers and cushions joints, to wear out, ulcerate and sometime disappear entirely, leaving painful bone-on-bone joints.

Researchers now claim with confidence that it is a mutant gene that causes the problem.

In the recent study in USA, genetic material was examined from 19 members of a family representing 3 generations — nine of whom had a form of osteoarthritis, called primary generalized osteoarthritis. When the gene for type-II collagen protein from the 9 was isolated, cloned and sequenced, all coding sequences were found to be normal, except for single base mutation.

The mutation converts an arginine residue to a cysteine, and amino acid not normally found in type-II collagen. The collagen was suspect because previous work by researchers at Thomas Jefferson University (USA), had shown that it is coinherited, and thus associated in some way with osteoarthritis.

This amino acid mutation was present in all affected members of the family, but not in unaffected ones, nor in 57 unrelated individuals. This suggests that some cases of primary generalized osteoarthritis are caused by the mutation, although the researchers believe other mutations or multiple factors could sometimes be involved. Some types of osteoarthritis are known to arise from non-genetic causes, such as joint injuries and bone defects.

A chemical interpretation of the findings is that the arginine-to-cysteine mutation causes deleterious structural changes in collagen. Type-II collagen molecules are composed of three chains that coil around each other to form triple helices. The helices then assemble further into tight bundles called fibrilla. The genetic flaw could possibly be disrupting both the triple-helix structure of type-II collagen and the ability of fibrils to form stable support structures.

This breakthrough could eventually lead to better diagnoses of and therapies for osteoarthritis. Genetic tests to identify carriers of mutation could be developed in future. In addition, the researchers believe it may be possible to develop drugs that manipulate the gene or block its action. (*C & EN*, 10/10/90, p. 8).

EPA IN USA APPROVES FIELD TEST FOR GENETICALLY-ENGINEERED BT

Sandoz Crop Protection (USA) Inc. has received EPA approval to field-test a genetically engineered strain of *Bacillus thuringiensis* (Bt). This approval marks the first ever field-test of a live

genetically altered microbe for pesticide activity. Sandoz markets pesticides based on insect toxins isolated from naturally occurring Bt strains for control of army worms, potato beetles and gypsy moths.

According to Sandoz, genetic modification leads to a two or three fold increase in effectiveness in lab tests over commercial strains, but results in microbes no different than ones that might occur in nature through gene exchange. Producing highly target specific insect toxins, the genetically engineered Bt is believed to present no risk to humans or other non-target organisms. Field tests will be conducted at Sandoz's farm at Greenville, USA and if successful, could lead to a new pesticide product in 3 to 4 years. (*C & EN*, 10/10/90, p. 8).

MYCOGEN RECEIVES A US PATENT ON A NEW BIONEMATOCIDE

Mycogen (San Diego, Calif.) has recently been granted a US patent for its bionematocides that protect crops and animals from microscopic roundworms. The biopesticide patent is based on Ecogen's research with novel strains of *Bacillus thuringiensis* (Bt). In the early 1990 Mycogen and Monsanto agreed to collaborate on using Bt technology to develop genetically improved crops with resistance to nematodes. (*Chem Wk.*, 9/5/90, p. 32), (*Chem Wk.*, 6/27/90, p. 74).

TWYFORD INTERNATIONAL WORLD'S BIGGEST TISSUE CULTURE COMPANY COLLABORATES WITH JAPANESE COMPANY

Twyford International Inc. of USA in which Kirin Brewery Co. (Japan) has a big stake, has taken over Weyerhaeuser Tissue Culture Centre in Florida, USA — a leading wood and related products company. TII has become the world's biggest company in tissue cul-

ture business with a share of about per cent of the global market after purchase of Hartman's Plants Inc. (Florida) in December 1988.

Till now it had three tissue culture plants in USA and one in the UK with sales for the 1990 business year projected at about ¥2.5 billion.

Kirin Brewery had bought 30 per cent of the equity shares of TII and has become the top stockholder of TII. Kirin and TII have teamed up with each other on mutual licensing of tissue culture technology and products developed by either of them as well as in use of the other's sales routes.

TII sees the takeover having a 'synergy effect' on both technology development and sales expansion leading to consolidation of its foothold in the world market. (*Japan Chem Wk*, 5/17/90, p. 8).

GENE EXPRESSED IN-VIVO VIA DIRECT TRANSFER

A new technique in which recombinant genes are expressed in-vivo after their direct introduction to tissue sites could prove useful in the treatment of diseases such as atherosclerosis and cancer, report researchers at Michigan Medical Centre. The same research group showed earlier that genes can be expressed in-vivo by implanting genetically modified endothelial cells at specific sites. However, the technique requires prior preparation and transduction of the endothelial cells, a process that takes several weeks. Now the researchers demonstrate expression of a gene in pig arterial tissue after direct transfer of genetic material (instead of previously transduced cells) to the site. When a recombinant B-galactosidase gene is introduced to a site — either by direct infection with a retroviral vector or that expression vector plasmids — B-galactosidase activity is detected at the site for weeks or months afterwards. (*Science* 249, 1285, (1990)).

R-APPLIED SURVEY OF PHYTOPLANKTON ON THE HORIZON

an Marine Science & Technology
e is planning to observe carbon-
de assimilation in the sea by look-
into the distribution of phyto-
ton and suspended including zoo-
ton using laser applied equipment.

phytoplankton living in the ocean
ants for 50-60 per cent of carbon
de assimilation conducted by all
arth's plants. Its activity exerts a
influence on global warming
ed by CO_2 . The new equipment
be mounted on ships and air planes.
ship-mounted type is in the final
e of development and will come into
tical use by the year 1992. The basic
gning of the airplane mounted type
also be inaugurated in 1992. The
pment incorporates a Nd/YAG laser
measures 685 nm fluorescence,
uted from phytoplankton. When
en coloured 532 nm laser beams are
ied thereupon. It is also capable of
lying the laser beams to suspended
erials, including zooplankton and
asuring the intensity of scattered light
tted therefrom.

The laser applied equipment has a
th resolution of 2m and can search
targetted material at a depth of up
50 metres. When mounted on ships
l aircraft, it facilitates continuous
servation for 12 and 4 hours respec-
ely. The researchers expect the
quipment to elucidate production/con-
sumption of CO_2 in the sea and plans
combine the above mentioned
quipment with artificial satellites in
ytoplankton observation in future.
(C.W., 3/1/90, p. 5).

NEW MATERIALS, CHEMICALS FUELS FROM BIOMASS FROM NEW TECHNOLOGY ON THE HORIZON

A resurgence of interest in the prod-

uction of new materials, chemicals and
fuels from biomass resources, such as
wood, cellulose, lignin, starch and chitin
is sparking active R & D efforts in these
areas in USA, Japan and several
advanced countries.

Biobased materials and chemicals
currently under development include
composites, conventional plastics with
lignocellulosics (chemicals from wood
and other plant sources), lignocellulosic
non-woven mats that can be pressed into
rigid shapes to form doors, walls and
even auto body parts; phenolic chem-
icals produced from wood waste and
bark; membranes made from chitosan (a
substance derived from chitin of crus-
tacean shells); and biodegradable plas-
tics containing starch.

A major goal of biobased materials
R & D is to use renewable biomass
resources to make new materials with
the same level of performance as metals
and plastics but that have special prop-
erties such as high strength, light-
weight, corrosion resistance and above
all environmental degradability (for
packaging plastics).

So far the use of biomass in mater-
ials and products has tended to be over-
looked or underemphasized. The
modern homo sapiens have looked at
biomass as a source of chemicals but
have not looked at its use for building
materials and other materials.

But now the tide is turning towards
greater and better biomass utilisation.
More markets will develop for both
low-cost materials and high-perfor-
mance composites that take advantage
of the wide distribution, renewability
and recyclability of lignocellulosics and
other biomass resources.

However, as yet there is not a single
country in the world (not even USA or
Japan) has as yet a national policy for
recycling and utilization of biomass and
wastes. The technology for production
of new materials from biomass and

wastes is yet in its infancy. Research-
ers are currently studying the formation
of new types of composites between
lignocellulosic on the one hand and
glass, metals, plastics or synthetic fibres
on the other.

In composites, fibres are embedded
in a continuous phase or matrix that give
the material a definite shape and surface.
Researchers at USDA have made
molded products from acetylated ligno-
cellulosic fibres.

They have shown that lignocellulosic
fibre composites made with non woven
mat technology can be formed into rigid
shapes.

Applications for these composites
include building materials and auto
parts. Wood itself a natural composite
of cellulose fibres in a matrix of lignin
(a phenolic polymer) and hemicellulo-
ses, lacks the consistency and uniform-
ity of properties of a homogenous
material.

However, researchers are now able to
produce high performance lignocellu-
losic composites with uniform densities,
durability in adverse environments and
high strength by using fibre technology
and high performance adhesives.

Wood plastic composites are cur-
rently being developed in USA and
Japan for use in building materials (such
as doors, windows, and wall and floor-
ing systems), reusable packaging and
other products.

Biomass is now being used experi-
mentally to produce chemicals. One
process under development involves fast
pyrolysis of wood and bark wastes, fol-
lowed by chemical fractionation to pro-
duce mixtures of phenolic compounds
that could replace phenol in phenol for-
maldehyde thermosetting resins.

The advantage of a process based on
a renewable is that the cost of the mete-
rial is lower than the cost of phenol.

Another biomass resource getting increasing attention in Japan and USA is chitin, which is isolated from crustacean shells. One of the most ubiquitous natural polymers, chitin is second only to cellulose in natural abundance.

Controlled deacetylation of chitin has produced chitosan, a substance that complexes metals and natural biomolecules very efficiently. Membranes made from chitosan are being investigated for use in ion transport, blood dialysis and sustained release of pharmaceuticals.

Starch, which can be obtained in abundant amounts from corn and other crops can become a renewable raw material from which a variety of chemicals can be produced, that are now obtained primarily from petroleum. These chemicals include starch derived from alcohols, polyols and acids.

Other researchers are incorporating starch into synthetic polymer films and bottles to enhance biodegradability.

Vegetable oils are another attractive renewable resource to researchers for preparation of a broad variety of unique monomers and polymers. One research group in USA is developing vernonia oil, a natural epoxidized vegetable oil, as a replacement for conventional solvents in alkyd and epoxy coatings and the other applications. Recent research in USA has also shown that lignocellulosic biomass represents a cheap feedstock for biological production of ethanol and other fuels and chemicals.

Researchers at the Solar Energy Research Institute have shown that enzymatic hydrolysis of cellulose in pre-treated biomass allows conversion to ethanol with every high yields.

The Tennessee Valley Authority (TVA) has been involved in the chemical conversion of cellulosic feedstock to ethanol and other chemicals for more than 10 years.

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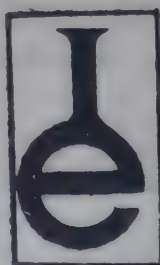
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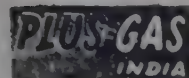
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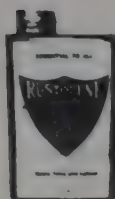
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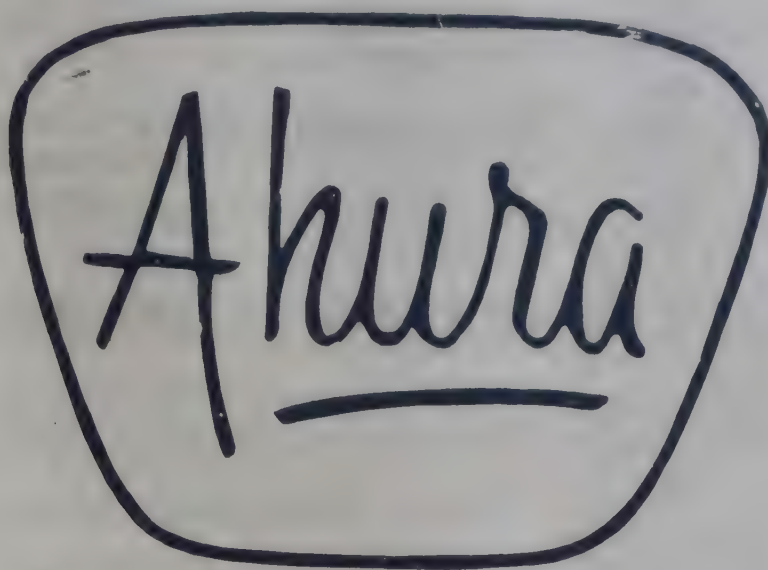
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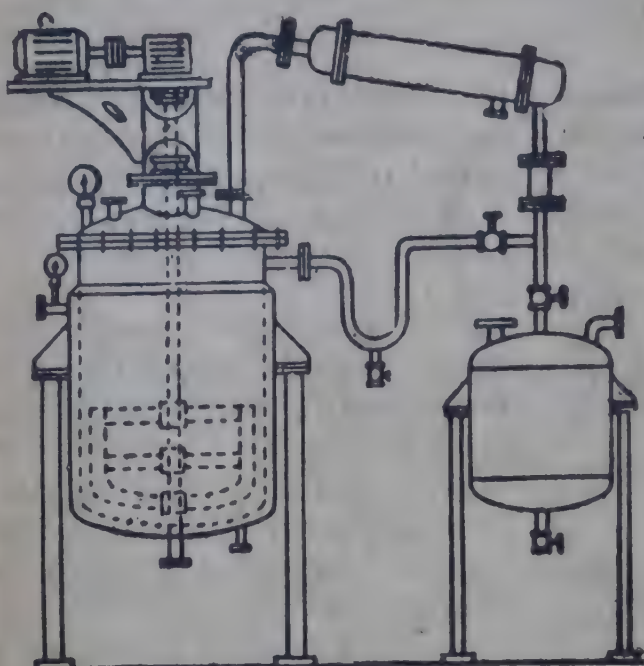
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Science Briefs

NEW PROCESS FOR HIGH PURITY SODIUM

A new method has been identified for production of high-purity sodium for use in the Fast Breeder Reactor at the Indira Gandhi Centre for Atomic Research, Kalpakkam. In this process, molten sodium tetrachloroaluminate containing excess sodium chloride is electrolysed at 200 to 250 degrees Celsius, using a graphite anode and molten sodium cathode. Beta-alumina is used as a diaphragm in the cell.

Beta-alumina acts as a physical barrier between the two compartments and at the same time maintains electrochemical contact between the two. Under the influence of an electric potential, sodium ions from sodium tetrachloroaluminate move through the membrane to the cathode compartment. Chloride evolution takes place at the graphite anode.

According to Dr. K.D. Mohandas, one of the scientists working on this project, the process is very energy efficient as the operating temperature is low and current efficiency is close to 100 per cent. In this process, an energy efficiency of 68.5 per cent can be obtained during electrolysis at 300 degrees Celsius. At present in India there is only one such electrolysis plant, owned by a private company at Baroda, which operates at 30 per cent efficiency.

"The process directly yields nuclear and battery grade sodium. One major advantage of the process is that the cells can be operated very conveniently for small requirements of high purity sodium. Recently we have demonstrated the feasibility of sodium production by this new method", Dr. Mohandas said.

Liquid sodium of very high purity is used as a coolant in Fast Breeder Reactors and in sodium-sulphur batteries. Impurities present in sodium coolant can

lead to undesirable problems like corrosion of structural materials, mechanical interferences in coolant passages and radioactivity burden in a fast reactor. Potassium-free sodium is essential for better performance of a sodium-sulphur battery.

P.T.I. Science Service
November 16-30, 1990 Pg. 1.

CHILLIE PROTECTS THE LUNGS

Eating chillies may be hot for the tongue and bad for the stomach, but they protect the lungs from the toxic effects of oxides of sulphur and nitrogen, say researchers.

The findings were reported by biochemists of the University College of Science, Calcutta, who studied the protective effects of capsaicin, the main compound present in chillie extracts, on lungs. They isolated 42 per cent pure capsaicin from *capsicum frutescens*,

the common green chillie, by repeated extraction through chromatography and studied its effects on male rats exposed to the toxic fumes of formalin, nitrogen dioxide and sulphur dioxide.

Pre-treatment with capsaicin protected the rats against lipid peroxidation and oedema induced by formalin, says a report by A.K. De and J.J. Ghosh in a newsletter of the Indian Council of Medical Research. Pre-treatment with capsaicin significantly decreased the lipid peroxides (LPO), cholesterol and peroxidase activities in rats exposed to 5 parts per million (ppm) of nitrogen dioxide. But it had no effect on the levels of collagen, catalase and superoxide dismutase activities.

The results were reverse in capsaicin-treated rats exposed to sulphur dioxide. The LPO values did not alter much compared to the control group, but the catalase and peroxidase activities

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ties changed significantly. However, more studies are needed to understand the exact mechanism of capsaicin action on the bronchial tracts, the report says.

P.T.I. Science Service
November 16-30, 1990, p. 1,2.

NEW RUST CLEANER

A new rust cleaner solution has been developed by scientists at the Indian Institute of Technology, Bombay. When applied to a rusted surface of mild steel with the help of a nylon wire brush or cotton linters, the solution removed the rust immediately and kept the metal rust-free for more than a month in an inorganic laboratory at 26 degrees Celsius and 70 per cent relative humidity.

When the cleansed steel surface is subjected to electroplating, a good adherent nickel coating is obtained. The important compounds in the cleaning agent are ethylene oxide, an inhibitor

and an ester specially made for this purpose. The scientists used orthophosphoric acid as a solvent to get a clear solution.

The new rust-cleaning solution did not have any harmful effect on the human skin. Rust cleaners are used normally in industries for the removal of rust as a pretreatment for painting or surface cleaning. Steel surfaces treated with rust cleaners can be painted or coated but cannot be electroplated due to the formation of non-conducting film on the steel surface by rust cleaner.

P.T.I. Science Service
November 16-30, 1990, p. 2.

NEW COATING FOR EQUIPMENT IN SUGAR INDUSTRIES

A new organic coating to protect the steel structures and equipment used in sugar industries has been developed by scientists at Karaikudi. Studies at the Central Electro Chemical Research

Institute (CECRI), Karaikudi, in Tamil Nadu, showed that a new epoxy-based coating was much better than chlorinated rubber-based paints in protecting the steel equipment in sugar industries. The results of the studies were published by scientists, M. Selvaraj and S. Guhiah from CECRI and T. Pazhakar, from Thanjavur, in the "Bulletin of Electrochemistry".

In sugar industries, mild steel structures are affected by corrosion due to high temperatures and the high moisture content and impurities in the cane juice.

Organic coatings available so far have not been effective in controlling corrosion. Scientists at the CECRI compared the epoxy and chlorinated rubber-based paints using pigments and extenders such as titanium oxide, mica and bentonite. Next, they studied the effects of the two paints on steel panels of different sizes. Tests showed that the flexibility, impact resistance and wet abrasion of both paints were good, but the hardness and adhesion of epoxy-based paint were slightly better when compared to chlorinated rubber paint.

Unpainted panels started rusting within one month when kept in a humidity cabinet. Epoxy-based paint was better than chlorinated rubber-based paint for coating equipment in sugar industries, the CECRI researchers conclude.

P.T.I. Science Service
November 16-30, 1990, p.

CHLOR-ALKALI MEMBRANE ELECTROLYSER

The Central Electro Chemical Research Institute (CECRI), Karaikudi, has set up a pilot scale membrane electrolyser of 5 kA current, after successful laboratory-scale trials of their chlor-alkali membrane. Membrane cell technology is the latest process for electrolytic production of caustic soda.

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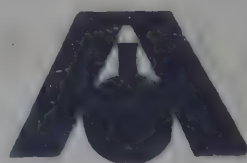
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membrane cells are pollution-free, as they use neither the hazardous pollutant nor the carcinogenic asbestos. In addition, they consume 20 to 25 per cent less electrical energy compared to traditional processes.

According to Dr. K. Asokan of CECRI, the cell frames are made of corrosion-resistant metals. The anode is coated with a special coating developed by CECRI to suit the specific operating conditions of the membrane. An activated cathode of perforated stainless steel coated with a mixture of noble or non-precious transition metals has been developed by CECRI. Scientists say the use of this activated cathode results in energy savings of 100 to 225 kilowatt hour per tonne of caustic soda.

P.T.I. Science Service
November 16-30, 1990, p. 2.

NEW SOURCE OF INOSITOL

A new economic method of isolating inositol, a vital ingredient of multivitamin preparations, from corn steep liquor has been developed at the Regional Research Laboratory, Jammu.

Inositol is not available indigenously and the demand for it is largely met through imports. Both corn steep liquor and rice bran are rich sources not only of inositol, but also of phytic acid and phytin which are important for the medical, dental and food industries. The JRL researchers found that of the two, corn steep liquor forms a better source from which isolation is simpler.

The researchers suggest that inositol should be considered as an import substitution product. During isolation, the researchers first removed proteins from the aqueous extract of corn steep liquor and precipitated phytin in the form of calcium phytate by adding lime.

They next hydrolysed the wet slurry of calcium phytate under alkaline conditions in an autoclave. The research-

ers obtained inositol by filtering out the hydrolysed product and crystallising it. The procedure yields about 4 per cent inositol. By passing the hydrolysed product over a cation exchange, the scientists obtained 70 per cent phytic acid and calcium phytate.

P.T.I. Science Service
November 16-30, 1990, p. 3

YEASTS ISOLATED FROM PALM WINE

Scientists at Hyderabad have isolated several yeasts from palm wine, which they say are responsible for the wine's nutritional value. Out of the various yeasts isolated, *Saccharomyces cerevisiae* yields more alcohol than others, like *Candida utilis* and *Kluyveromyces fragilis*.

Saccharomyces cerevisiae is a better food supplement in terms of cell proteins, amino acids and thiamine composition, an analysis by research-

ers of the Osmania University, Hyderabad, shows. The most significant result of the study is the finding that *Saccharomyces cerevisiae*'s amino acid composition is similar to that of soyabean and that this strain of yeast could be used as a substitute for soyabean oil.

With 47 per cent proteins and 40 micrograms of thiamine and riboflavin per gram dry weight of the cells, the yeast strain forms a good food supplement, the researchers say.

P.T.I. Science Service
November 16-30, 1990, p. 3

TRYING TO MAKE SQUIDS WORK

In many laboratories across the world, scientists are racing to demonstrate one of the most promising applications of high temperature superconductivity: a magnetometer made from a SQUID, the acronym for superconducting quantum interference device.

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According to a report in the journal *Science*, physicists from two laboratories are now close to achieving working models of the device which could ultimately be used for safe, nonintrusive examination of the human body, detailed studies of the earth's crust and even the detection of submarines in oceans.

A SQUID is essentially a superconducting loop with two wire leads attached. Electrons move around the circuit without resistance except at two points, where small barriers are built into their path. Here the electrons can get through only by tunneling.

Because of quantum mechanical interference effects, the voltage across the wire leads serves as a sensitive measure of the applied magnetic fields. SQUID magnetometers which are sensitive detectors of magnetic fields have already proven their worth in sensing extremely weak magnetic fields. Phys-

icists believe SQUIDS will make it possible to detect magnetic fields associated with the heart, lungs, and even the brain. The difficulty in making the device however lies in the breaks. If they are more than a few angstroms, the SQUID will not work. Now a technique developed by researchers at IBM involves making a thick circuit with two narrow necks. These necks will often have natural breaks in them because the superconductor consists of many individual crystals or grains and the boundary between the two grains provides a barrier to electric current.

Although the researchers cannot guarantee the presence of such breaks, about five per cent of their attempted SQUIDS have the right combination of grain boundaries to produce a device that works at temperatures of liquid nitrogen at which high temperature superconductors are obtained. IBM's devices have the best signal to noise of

any of the devices reported so far.

Another team at the University of California in Berkeley are studying another part of a SQUID magnetometer—the flux transformer which amplifies magnetic fields. A flux transformer is a large field detecting superconducting loop, coupled to a small multiple-turn coil that generates an amplified version of the field, fed into the SQUID, and amplifies the fields. The amplification is proportional to the number of turns in the coil. Thus, increasing the number of turns, it is possible to amplify magnetic fields hundreds of times.

The Berkeley scientists have made flux transformers out of the high temperature superconductor $\text{YBa}_2\text{Cu}_3\text{O}_7$ with input coils of up to 19 turns which amplify the field ten times. According to the researchers, this was possible by making crossovers—two crisscrossing strips of superconductor separated by an insulating layer.

According to the report in *Science*, the superconductor is so sensitive that it tends to lose its superconductivity when covered by a layer of another material.

It took the team nearly six months to build crossovers that worked at the temperature of liquid nitrogen. Berkeley scientists believe that the technology for making the crossovers should thus open new electronic applications for high temperature superconductors.

P.T.I. Science Service

November 16-30, 1990, p. 11

FILM PROTECTS CROPS FROM PESTS

A Japanese company, Sumitomo Chemical Co. Ltd., has developed an agricultural mulch film made of high density polyethylene that protects crops against thrips, aphids and other phloem-feeding pests by reflecting ultraviolet rays. Reports the journal *Prism*.

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ause it creates less glare than products made with aluminium a mixing vapour-depositing pro- t makes agricultural work easier.

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bsorbs visible rays and effectively ts specific ultraviolet rays. And ase pests tend to gather where le rays are strong, but stay away ultraviolet rays, it is especially tive in repelling thrips and aphids h are highly resistant to insecti-

s anti-glare surface not only makes sy on the eyes, but also prevents the kled leaf blotch of summer/autumn etables and the scorching of fruits, enhancing the yield and quality of rops.

can be used with a wide variety of cultural products from vegetables fruits to flowers.

P.T.I. Science Service
November 16-30, 1990, p. 11,12

FERTILISER REVITALISES DAMAGED SOIL

A fertiliser developed by a Japanese mpany Ikilun Co. Ltd., can revitalise l damaged by acid rain and chemi- fertilisers. It is mainly composed of nerals extracted from plants, reports e journal *Prism*.

Since it returns depleted minerals to e soil, its effects are immediate and ng lasting.

This liquid fertiliser is composed ainly of calcium, magnesium and otassium extracted from more than 10 fferent kinds of plants and fruits by bacteria-fermentation process, the urnal said. Though these minerals ave long been known to be effective

in preserving raw and processed food products, it was only recently confirmed through studies, to be effective in revi- talising soil and plants damaged by acid rain.

The fertiliser, also called Ikilun, is also expected to boost crop productivity.

P.T.I. Science Service
November 16-30, 1990, p. 12

SUPERCritical METHOD AS WASTE DETOXIFIER

A new technology for destroying aqueous toxic wastes called supercriti- cal water oxidation shows promise for detoxifying the waste efficiently, cost effectively and in an environmentally friendly manner, say scientists at the Sandia National Laboratories in Cali- fornia, United States, where work on the technology is under way.

According to the journal *Chemical and Engineering News*, the concept

involves relatively low temperature but moderate pressures — about 300 atm. and 500 degrees celsius — conditions under which water becomes a fluid with unique properties that can be used to selectively destroy organic wastes.

Although the concept of using super- critical conditions for oxidizing toxic materials originated about 10 years ago at the Massachusetts Institute of Tech- nology, the journal quoted Sandia Sci- entist Sheridan Johnston as saying that it is a whole new area of chemistry that remains an enigma.

“No one really knows what goes on inside a supercritical water reactor or how to scale up to commercial opera- tion”, the journal quoted Johnston as saying.

“We hope to change that situation and share our results with the industry”.

P.T.I. Science Service,
November 16-30, 1990, p. 13

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First IUPAC Workshop on Safety in Chemical Production

Summaries of papers presented

The first IUPAC Workshop on Safety in Chemical Production was held in Basel, Switzerland from September 9-13, 1989. We present in the following pages summaries of some of the papers presented.

FACT FINDING AND BASIC DATA, PART I: Hazardous properties of substances. R.L. Rogers, ICI Fine Chemicals Manufacturing Organisation, Manchester, UK.

The origin of the safety problem which arises not only in the manufacture of chemicals but also in their transport, storage and use is the inherent hazard potential hidden within the substance. These hazardous properties include toxicity (including ecotoxicity), thermal stability, fire or flammability and explosivity. However it is critically important to recognise that the possession of hazard potential by a substance does not make that chemical hazardous per se. For a hazardous situation to occur i.e. the release of a chemical's hidden hazard potential a trigger mechanism must also be present. This trigger or activation potential resides in the plant/equipment, the chemical process or method of handling of a chemical.

For example, water is a necessity for life, however it could also be considered as toxic since it can cause drowning. Similarly wood in a tree is difficult to ignite and burns relatively slowly but when finely divided, as occurs in a sawmill, the resultant fine wood dust can be readily ignited and lead to a violent dust cloud explosion. It is evident therefore, that the hazard characteristics of a material cannot be simply considered, measured and tabulated as other physico-chemical properties of substances such as melting point, vapour pressure etc. Hazardous properties vary with physical form and depend markedly on the interaction of a material with the associated equipment or usage.

In evaluating hazards it is therefore necessary to obtain data on both the substances being handled and the equipment or process within which they are being used. This paper concentrates on the identification and evaluation of hazardous properties of single substances and their undesired decompositions. The hazards associated with carrying out undesired reactions in chemical manufacture are covered in Part II while the problems associated with flammability and ignition risks are considered in Part III.

Decomposition of chemical substances is usually an exothermic process and is often accompanied by the evolution of gas. The kinetics of such reactions are invariably governed by the Arrhenius law i.e. the rate of decomposition, which for exothermic processes is equivalent to the rate of heat evolution, increases exponentially with temperature. The hazard

arises in practice because the rate of heat loss only increases linearly with an increase in temperature. A similar problem occurs with scale, heat production increases with the mass of volume of the substance while the corresponding increase in heat loss is smaller as it is dependent on the surface area of the container.

Concepts such as adiabatic temperature rise, time to maximum rate associated with undesired reactions and the relevance of Semenov and Frank Kamenetski heat transfer mechanisms will be explained in detail. In addition the problems associated with measuring such hazardous properties and the interpretation of the data obtained and its relation to plant scale situations will be discussed and illustrated with examples in the paper.

FACT FINDING AND BASIC DATA, PART II: Desired chemical reactions. R. Gygax, Ciba-Geigy AG, Basle, CH.

Important data of hazard analysis concern the knowledge of the two components of hazard, severity and probability. As has been shown in the first part, the energy potential inherent in the materials processed is the dominant factor which determines severities. Probabilities are linked with mechanisms of activation of these energy potentials. In order to judge upon such mechanisms, they must be identified and studied.

Physical transformations are normally not linked with release of energy. Therefore, if storage or physical operations are the subject of hazard analysis, an adequate procedure is

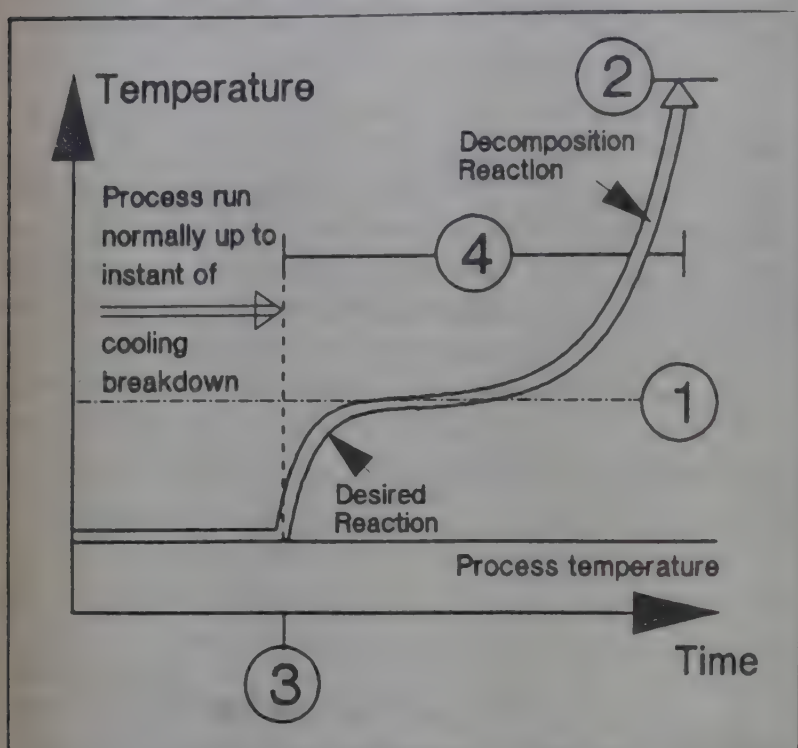
1. to identify conditions under which undesired chemical transformations do produce dangerous rates of energy releases and
2. to define safe operational limits sufficiently away from such conditions.

In chemical syntheses, however, the very goal is chemical transformation, which is often linked with energy release. Then the necessary approach of assessing the thermal hazards is fundamentally different:

For a synthetic process to be safe, two basic conditions must be fulfilled:

1. The heat release during the process must be known and the process equipment must be designed such that safe dissipation of the released heat can be assured at all times.
2. The process must be sufficiently tolerant towards deviations from the operating conditions. E.g. a complete breakdown of the cooling capacity, which is taken as prototype of deviation, must not lead to intolerable consequences.

To satisfy the first postulate, the fact finding procedure involves providing data on the energy release investigated under the true operating conditions of the process, and then to apply genuine engineering knowledge to deal with the heat dissipation properties of the production equipment and to take into account the laws of scale-up.



The second postulate calls for thermokinetical data on both the desired reaction and the undesired decompositions. These data enable the investigator to sketch worst case runaway scenarios, which must be expected under given failure modes. In order to characterise a failure mode scenario, data on the main features of runaway profiles are determined. They include (See figure):

1. The maximal temperature which will be reached after the cooling breakdown if, in a first consideration, only the heat of the desired reaction is taken into account.
2. An estimate of the end temperature of the runaway of secondary, undesired reactions.
3. The instant within the process, at which cooling breakdown leads to the most consequential runaway profile.
4. The time frame, within which the projected runaway reaction is predicted to occur.

Even if heats of synthetic reactions are comparatively small, the ways of activation of any higher decomposition energies depend strongly upon them and on the way the process is conducted (points 1 and 3). This important statement implies that it is possible and desirable to influence the overall course of the predicted runaway behaviours, and thus the hazards, by process design. Rather than merely testing the final plant procedure for its safety data, the mitigation of its runaway behaviour by optimisation of the process parameters must be considered at the process development stage.

This integrative approach allows to reduce the potentials, which is more beneficial than coping with identified hazards by technical and organisational measures taken at the plant level.

The full paper will concentrate on examples and experimental techniques used to evaluate data concerning points 1 and 3. Providing data related to points 2 and 4 requires the same techniques and methods as have been discussed in the prior contribution for the assessment of physical processes and storage.

FACT FINDING AND BASIC DATA, PART III: Fire and explosion. H. Schacke, Bayer AG, Leverkusen FRG.

Hazard potential

The hazard potential, its origin from the reactivity of the chemical substances and its consequences in safety considerations for chemical production have already been introduced by the preceding papers (Fact Finding, Basic Data, part I and part II). In terms of flammability and explosivity the hazard potential of chemical processes and plants is given by the ability of many chemical substances to undergo — as the **fuel** — **exothermic oxidation reactions** (combustion processes in the gas phase (i.e. in a certain **desired state**). These reactions are accompanied by considerable energy release, noticeable as heat, radiation, pressure-build-up.

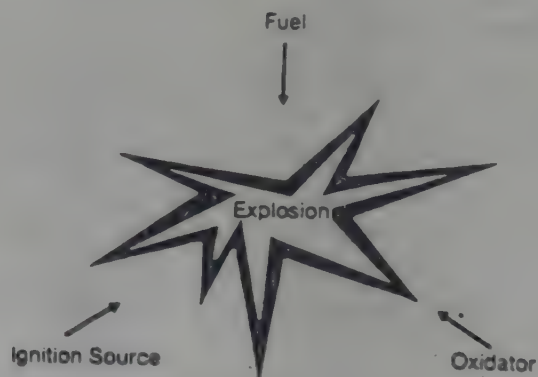


Fig. 1 Explosion factors

In contrast to stationary combustion (burning) for an explosion an independent propagation of the reaction zone (flame) through the free volume with the reactive mixture is essential. This latent hazard potential may be triggered off by an **initiator**, the ignition source. So the unholy trinity of "fuel", "oxidator", and "ignition source" fairly well describes the scope for which basic data are needed.

Combustion properties

Since in this context it is not the chemical substance by itself which represents the hazard potential but its proper mixing with the oxidator (usually the oxygen of the air), in a first step the characteristics of the system fuel/oxidator have to be determined. These should answer the question whether

the substances may give rise for fire or explosions. Important data here are e.g.

- 1.1 Burning index BZ, burning velocity of coherent solids or powder accumulations
- 1.2 Flashpoint T_f of a liquid as the lowest temperature at which the liquid will burn when ignited or will form explosive vapour/air mixtures
- 1.3 Explosion limits LEL/UEL as concentrations of gases, vapours, or dusts dispersed in an oxidising gas phase (including the limiting oxidator concentration LOC), defining explosive concentration ranges.

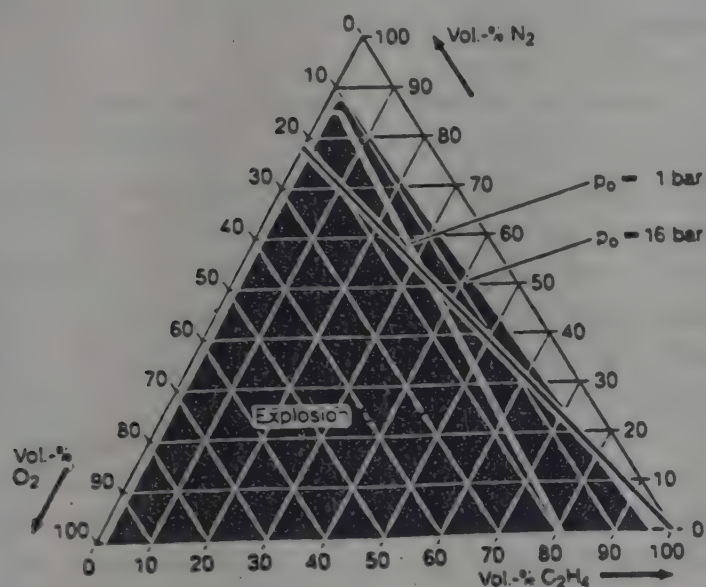


Fig. 2 Explosion limits for $C_2H_4/N_2/O_2$

Ignition requirements

In the second step one will have to find out the (minimum) requirements to activate the fire and explosion hazard, i.e. the flammable or explosive system's characteristics for being ignited. Relevant to this task e.g. the

- 2.1 Ignition temperature AIT as the lowest surface temperature to start ignition
- 2.2 Minimum ignition energy MIE as the lowest (electrical) energy to start ignition

can be considered.

Effects of explosion

The third step will focus on the explosive system's behaviour after ignition thus indicating the physical explosion effects. These effects can be characterised by data as

- 3.1 Maximum explosion pressure P_{max} (in an enclosed volume)
- 3.2 Maximum rate of explosion pressure rise $(dp/dt)_{max}$
- 3.3 Heat of combustion H
- 3.4 Maximum experimental safe gap MESG as a measure for flame quenching.

The above data solely describe characteristics of chemical substances. They can be obtained by lab-scale experimental investigations, in a few cases also by calculation

methods. (Some of the experimental methods have been standardised). The type of the necessary experimental equipment ranges from rather simple (screening methods) to fairly sophisticated, with the experimental results always being subject to the drawback of **not** describing natural constants. Nevertheless, the thus defined characteristics of chemical substances in many cases allow also for a very useful practical classification and rating. The safety data usually will have to be complemented by standard physical/chemical data (e.g. vapour pressure, density, solubility).

Process and plant parameters

As pointed out by the preceding papers, it will not be sufficient for risk assessment having arrived at this base set of data. One will rather have to compare these data with the characteristics of the chemical **process** and the **plant**, also in failure states. Not necessarily that information in all cases has to consist of quantitative numbers. So in a fourth step information must be available with respect to the first and second step about e.g.

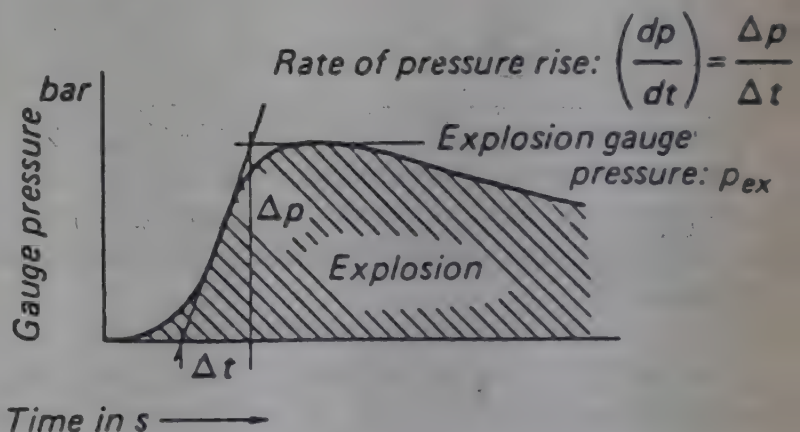


Fig. 3 Typical pressure/time curve

- 4.1 Presence and amount of oxidisable substances
- 4.2 Possible process temperatures
- 4.3 Degree of dispersion of flammable substances
- 4.4 Generation and characteristics of possible ignition sources (via electrical and electrostatic data, mechanical parameters, apparatus design and materials, etc.).

Conclusion

The base set of data 1 to 3 combined with the information obtained in 4, will provide a sound tool in evaluating the fire and explosion hazard. At the same time they serve as a basis for the design of appropriate safety countermeasures. These measures aim at the **elimination** of at least one of the **explosion** actors or the minimisation of their coincidence by a probabilistic concept (ref. Fig.

4, groups 1 and 2) or, alternatively, at the **reduction** of the dangerous explosion consequences to a tolerable degree (ref. Fig. 4, group 3). To safely cope with the consequences of an explosion of the respective measures generally require the implementation of (explosion) pressure proof apparatus and equipment.

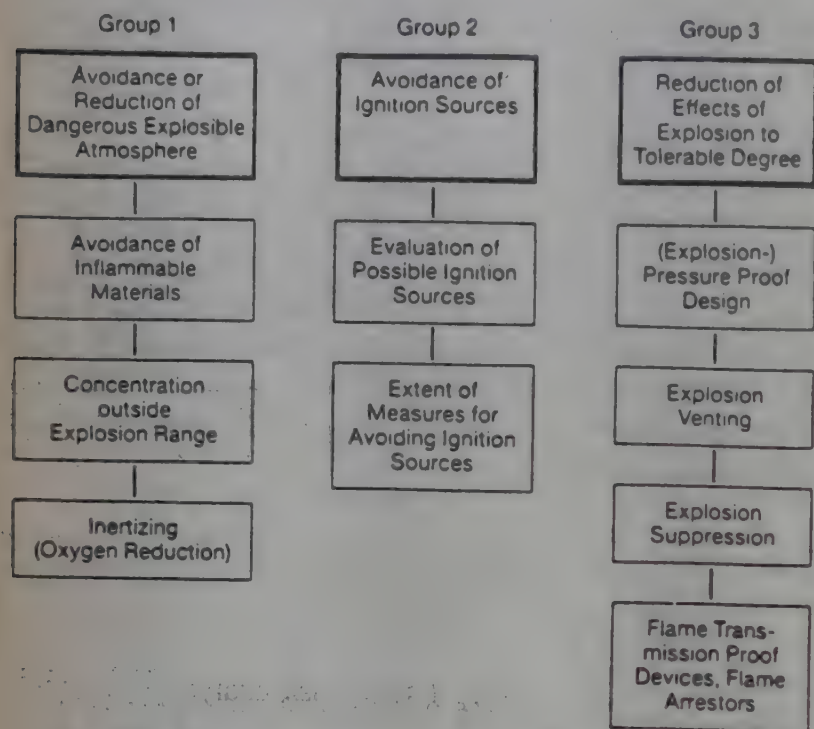


Fig. 4 Principles of explosion protection, relying on basic data according 1-4

IDENTIFICATION OF HAZARDS. V. Pilz, Bayer AG, Leverkusen FRG.

A hazard is the potential harm that a plant or process can cause to living organisms or to the environment. In chemical processes, hazards generally arise from the reactive potential of the substances used. The reactive potential of chemicals can have a direct effect on living organisms. Consequently, the release of a substance of this type can represent a health hazard or damage the environment. A hazard may also occur indirectly if energy is released as the result of an undesired reaction. An explosion is an example of rapid and intense energy release.

In order to ensure that a process is safe, all possible hazards must be identified and assessed, and measures must be taken to counteract them. Suitable measures will be outlined in the section on risk reduction. Hazard identification starts from the basic safety data for the materials, e.g. flammability, explosibility and toxicity. Data characterising these properties are established via tests, as discussed in the section on fact-finding and basic data. One type of hazard, for instance a dangerous reaction with a high energy release rate, can be caused by various factors such as inappropriate materials or an incorrect temperature regime.

Hazard identification thus consists in establishing all the different ways in which a chemical process can reach a dangerous state, as identified by experimental investigation of the basic properties of the materials involved. Proper hazard identification must therefore be based on knowledge of the properties of the materials, process characteristics (as shown in flow charts and piping and instrumentation diagrams), process parameters (such as temperature, pressure, concentration, residence time and flows of heat and mass), and plant design characteristics. Hazards can then be identified by a comparison of process data and possible excursions (or deviations) from these data with the danger spots determined by experiments.

A very systematic procedure is thus required. Hazard identification must be integrated into every stage of the development and design of a process from the laboratory to bench scale, and from basic design to detailed engineering. Various problems are located at each stage, so hazard identification must focus on different aspects as appropriate. Each design and each design stage may bring new hazards which it is necessary to look into. This may involve new experimental investigations and additional measures. Hazard identification therefore has to be based on a stepwise, iterative procedure. It should not only include normal operation of the plant, but also deviations caused by disturbances, e.g. interruptions in the energy supply and variations in input materials, and it should also include start-up, shut-down and maintenance procedures. Finally, hazard identification should accompany the plant design process, becoming more and more detailed as this progresses. Clear and thorough documentation, which can be relied on later, is thus essential.

There are a variety of useful tools which aid systematic hazard identification. Two examples are elaborate checklists based on experience, which outline potential problem areas, and the HAZOP method, which uses guide words to identify problem areas and tables to document the findings. The presentation uses practical examples to demonstrate the use of these methods.

ANALYSIS AND ASSESSMENT OF HAZARDS AND RISKS. J.L. Hawksley, ICI, UK.

Safety in chemicals production requires, firstly, an understanding of the "hazards". It is then the responsibility of those managing the business to ensure that appropriate measures are taken to make the likelihood of harm actually occurring, that is the "risk", as low as is acceptable or tolerable. The understanding of the hazards and the likelihood of harm arising requires technical "analysis" of the possible harmful consequences and the likelihood of events that could give rise to those consequences. The "assessment" of the acceptability or tolerability of the resulting risks requires value

gements to be made. Hence, there is a progression from hazard analysis through to risk assessment. There are various techniques to help with the analysis and assessment; these range from the mainly qualitative to those with varying degrees of quantification.

Basic hazard indicators are the "intrinsic" properties of substances involved, e.g. flammability, toxicity, volatility, etc. In some instances there are agreed/accepted values of these parameters which define various degrees of hazard, e.g. statutory definitions of "very toxic" or "toxic" substances, etc. Then there are the "extrinsic" factors with regard to the conditions of containment of the hazardous substance — e.g. temperature, its pressure, the environment (with respect to the effects on the integrity of containment and the consequences of loss of containment) and its inventory. A judgement of extent of hazard can be made noting these intrinsic and extrinsic parameters.

In some cases there are statutory definitions of substances and quantities that are deemed to constitute "major" hazards (e.g. in the so-called Seveso Directive of the EEC). For flammable substances a more objective assessment can be made using, for example, the Dow or Mond Index which generates, from the intrinsic and extrinsic factors a number which can be converted from a fixed scale to a qualitative description of degree of inherent hazard on a scale ranging from, for example, MILD, through HIGH to VERY EXTREME. The hazard index can be extended to give a measure of risk by taking account of the various extrinsic safety measures that are or would be needed to ensure safe operation. These "offsetting" factors typically reduce the ranking by one or two levels. For toxic substances some similar hazard indices are available, but are less refined.

The technique of "risk analysis" can be applied when specific accident possibilities can be identified. It involves evaluation of the consequences and/or likelihood of occurrence of the accident. It may then include an evaluation of risk when it is possible to estimate, say, the probability of exposure of a person, or persons, to the harmful effects of the accident(s).

How far the analysis can, and needs, to be taken varies from one situation to another. For example, in some cases consequence analysis with no analysis of probability of occurrence may be a sufficient basis for an assessment. This might involve the calculation of the overpressures that could occur at various locations as a result of an explosion, the gas concentrations that could occur down wind of a release of toxic gas, etc. In some cases, particularly where the consequences of the accident could be very severe it may be helpful to estimate the likelihood of the event and also the risk of harm in order to judge the significance of the situation.

Two parameters of risk are commonly used, "individual risk" (the chance of a person at a given location being killed) and "group risk" or "societal risk" (the likelihood of accidents causing multiple fatalities).

To assess the results of a risk analysis the predictions are compared with appropriate criteria. These include hazard effect levels (thermal radiation, explosion overpressure, etc.) accident frequency targets and "acceptable"/"tolerable" risk values. It has to be stressed that the technique of quantified risk assessment (QRA) has its limitations. Uncertain calculation methods, uncertain data and the need to make a number of assumptions limit the reliability of the predictions. The uncertainty must be taken into account when using the results of an analysis. QRA is a tool to help decision making with regard to, say, what safety measures are necessary, but it cannot be precise and does not remove the need for experienced judgement. The various techniques outlined play a part (along with others) in helping to achieve the optimum ways of assuring safety in chemicals production.

REDUCTION OF CONSEQUENCES. K. Eigenmann, Ciba-Geigy AG, Basle, CH.

The result of the previous steps of risk analysis — collection of basic data, definition of safe process conditions and identification of potentially hazardous deviations thereof — is a list of hazards, which are evaluated with regard to probability of occurrence and severity of possible consequences. All these analyses are the basis for the actual risk reduction. Risk reduction without prior systematic analysis may be incomplete and incoherent.

In order to reduce risk two principal routes are possible: Reduction of possible consequences (or severity) and reduction of probability (or frequency). Both are equivalent only from an insurance point of view. In a technical and operational sense the two dimensions of risk are quite different: Risk reduction by reducing the possible consequences usually is an inherent improvement of a process or installation, whereas reduction of probability is often only effective as long as maintained and managed properly. Furthermore, emergency preparations must always be directed against the most severe possible consequences.

In the chemical industry the severity or consequences of a risk depend primarily on the properties and amounts of the chemicals used and stored and on the characteristics of the reactions and processes. Therefore, reduction of consequences must be a design criterion in the early stages of process development. Key factors are

- the synthesis route, which determines the chemicals and chemical reactions.
- the process technology, which influences process con-

- ditions and the hold up of chemicals and energy
- the material flow concept, which determines the necessary storage capacity for raw materials, intermediates and final products.

Minimisation of the risk potential in the course of process development is the most powerful tool for reducing the consequences because it eliminates the source. Many technical safety measures aim also at reducing the consequences but without reducing or eliminating the cause or potential, e.g. in explosion protection: explosion venting, explosion suppression or pressure resistant construction leave the potential for energy release unchanged but reduce with high reliability the consequences of an explosion. This type of consequence reduction often requires constant attention and maintenance in order to keep it effective.

Reduction of consequences with all its advantages is not in all cases practically feasible. In such situations the powerful and sophisticated methods for improving reliability or reducing probability serve an important purpose.

REDUCTION OF PROBABILITY. R. Papp, Atochem, F.

The chemical industry, as many other human activities, has a must: controlling the technological risks associated with its activity. Because the products handled are often hazardous, the operations involve in many cases high energy levels, risk control needs, specific techniques, procedures and overall rigour, key to plant safety. The chemical industry has made considerable efforts and devoted substantial financial resources to the solution of safety and environmental problems. It needs to go on doing all that is technically possible, economically reasonable, and legally required.

However, expressions such as "total safety" or "risk free" are practically meaningless. The idea of risk free is utopic, and not only in the chemical industry. Risk is normally defined by the potential hazard and the probability of the hazard to happen. It is clear that higher is the potential hazard, lower must be the probability of the event. Many methods have been developed in order to estimate such probability. Such methods will be reviewed in this presentation.

These methods are developed in order to be applicable in the various steps of ensuring safety. They intend to take all necessary measures in the design, construction, operation and maintenance of the production units. Each step needs different techniques to be applied. A key point overall is the identification of the potential hazards and their causes. It is obvious that an unknown hazard will never be properly controlled. Here again, several techniques, including highly elaborated procedures, laboratory techniques and computer simulations, have been developed since 15 years, techniques

which shall be reviewed in this presentation. Reducing probability of hazard involves sometimes the use of quantification. The help and limits of such quantification will be discussed.

SAFETY MANAGEMENT. P. de Voogd, Shell Internationale Chemie Maatschappij B.V., NL.

The paper will include:

- A review of issues which have to be managed for safety in the manufacturing chemicals.
- Installations. The technical aspects: process chemistry, physical conditions, process safeguards, technical integrity of the equipment, facilities for dealing with unwanted excursions are all part of the intrinsic safety to be considered at the design stage. During the lifetime of the installation, the safety has to be maintained and where possible improved. This requires regular reviews, inspection of equipment, proper maintenance and upgrading. As many of these technical aspects will be subject of other presentations during the workshop, this paper will only briefly discuss them but will highlight aspects to take into consideration in various countries.
- Interface. The installations must be user friendly: ergonomics will define good operability, access, information presentation. The people operating and maintaining the installation must be trained in understanding the process and the limits of the equipment, in what can go wrong and how to prevent it. Research is presently being conducted to reduce the likelihood and extent of human error.
- People. Everyone working for a company — managers, technologists, operators, etc. — need to be committed to giving safety first priority. An essential feature of a good safety management programme is to create a culture in which everybody adopts a behaviour of safety first in their task and in fact in day to day life. The experience in Shell is that enhancement of safety has resulted in reduction of the number of worker injuries. The high attention to safety is also expected to result in lower technical risk through more reliable designs, more reliable installations and fewer operational errors.

STEWARDSHIP OF CHEMICAL PRODUCTION RISKS. W.W. Lowrance, The Rockefeller University, New York, USA.

A few "risk" basics

Risk is a compound estimate of likelihood and severity of harm. A key to dealing with risks is recognising three separable modes of analysis and action:

Risk assessment, description of the likelihood and severity of threat;

Risk appraisal, *evaluation* of the personal or societal burden from the risk, the costs required for protection, and the payback expected from risk-reduction investment; and

Risk response, *prescription* of "what to do about" the risk.

These modes are distinguishable but interrelated. **Risk assessment** finds facts; **risk appraisal** weighs consequences of the facts in light of personal and social values; and **risk response** makes action-decisions based on the facts, values, and pragmatics.

Defining boundaries

The outcomes of all risk analyses are very sensitive to the boundaries that are adopted (such as which issues are considered) and the analytic assumptions that are incorporated. In chemical industries, typical bounding issues include: operations limits (for instance, are transport risks to be included?); misuse or abuse risk-causes; associated physical risk-causes; associated natural catastrophic risk-causes; routine chemical releases; wastes; catastrophic chemical releases; subjects at risk; environments at risk; social structures at risk; derivative effects; and time horizons.

The establishing of these boundaries and assumptions — which gives guidance to engineers and economists who perform the analyses, and which sets the ground for social debate over the specifics — clearly is an ethical and political matter. One of the principal values of regulatory and public review analyses is debating these defining issues.

The social riskbearing context

All of these matters are of concern not only to directly affected people, such as plant employees, and to "the public" and its representatives and surrogates, but also to plant managers and government officials who must exercise civic duty. Concerned citizens may well be seeking, not detailed debate on specific questions, but general reassurance.

The broader contexting questions include:

Generally, is the production activity worthwhile and responsible?

Has every reasonably-expectable precaution been taken to reduce the risks?

Are the risks similar to other, familiar and routinely-borne risks; or are they strange or exceptionally high?

Are the people potentially at risk informed of the risks, and of how to take personal precautions? And have the people most at risk consented to bear the risks?

- * Do those who bear the risks, benefit from the activity that generates the risks (or willingly accept compensation from those who benefit)?
- * Are the authorities in charge of managing the activity and controlling its risks competent, honest, well-intentioned, and trustworthy?
- * Is demonstrable progress being made in managing the risks better?

Many of these can be answered in commonsense language. Debates may center around "worthwhiteness", "reasonably expectable precaution", and informed consent. Social justification of chemical production must center on reducing the risks to very low levels *so as to accrue the societal benefits*. All risk-reduction efforts should be viewed as societal investments.

A major difficulty for chemical enterprises is that because most members of the public lack firsthand experience with primary production, they fail to appreciate the importance of producing the commodity, intermediate, and fine chemicals that are required for securing the agricultural, transportation and other benefits that they are avid consumers of. Every possible effort should be made to remedy this unawareness.

Chemical production stewardship

These chemical issues now are public issues. In recent years a number of very constructive social experiments and institutional reforms have been undertaken (to be described). The following practices can help foster an atmosphere of trust and responsible progress:

- * Proceed openly, in consultation with affected communities.
- * "Frame" the issues sensitively. Because the answers derive from very different sources, distinguish among elements of assessment, appraisal, and response. Encourage the involved and affected parties to articulate their questions and concerns.
- * Seek agreement on procedures for resolving any contended technical issues.
- * Provide genuine opportunities for citizen participation. Recruit nonadversarial participants to "fill the middle" between extreme views. Involve teachers, physicians, or other citizen-experts in helping frame and interpret the issues.
- * Involve civic groups, professional organisations, dispute-resolution organisations, or university groups, to provide expertise and broaden representation.
- * As improvements are made in managing risks, inform the public.

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OCCUPATIONAL HYGIENE

An essential component of risk management

M. GUILLEMIN, University of Lausanne, Switzerland

R. ROTH, Sandoz AG, Basel, Switzerland

Introduction

Hazards in the occupational environment are of multiple nature. Their origins, sources, impacts and consequences on life, health or material may be extremely different and sometimes very complex to assess or to anticipate. The control and the management of these hazards require such a large amount of knowledge and experience in various fields that a multidisciplinary team approach is necessary.

This paper will present the nature and the role of the science called "occupational hygiene" in the general framework of risk management in the chemical industry. It should be stressed that such a presentation cannot be comprehensive and will be limited to a few relevant key elements aiming at the illustration of the importance and the usefulness of occupational hygiene in the management and control of hazards. Focus on chemical hazards appears to be appropriate in this context but does not mean that occupational hygiene is restricted to these ones. The purpose of this paper is to provide the "educators" in the chemical industry or in universities with a simple document introducing occupational hygiene as a necessary tool for managing health and safety in the chemical production.

Definition of occupational hygiene

The International Association of Occupational Hygienists (IAOHA) has adopted the following definition:

"Occupational Hygiene is the discipline of anticipating, recognizing, evaluating and controlling health hazards in the working environment with the objectives of protecting worker health and well-being and safeguarding the community at large". This definition helps to understand which type of hazards may be controlled and managed by this science and by which approach. In principle, these hazards and stresses should be measurable so that they may be objectively assessed and evaluated as far as their health risk (both acute and chronic) is concerned. The basic approach described in this definition is divided in three major steps:

1. anticipation/recognition (detection)
2. evaluation (assessment)
3. control (correction or prevention).

Moreover this definition stresses that occupational hygiene is also concerned by the community as a whole. This means

that the control of pollutants and hazards inside the factory must take into account the protection of the environment by eliminating (substitution, retention, destruction) the potential air, water or soil contaminants at their source instead of emitting them in the environment. An appropriate risk analysis and hazard evaluation at the workplaces will also help to avoid catastrophic events and therefore will protect the surrounding population. This important aspect of occupational hygiene has often been underestimated.

"Occupational hygiene is a science which protects both the workers and the environment". According to a document of the World Health Organization¹, "an occupational hygienist is a person with a university degree in engineering, physics or chemistry or an equivalent science degree (in some countries, medicine), and, in addition, with specialized training in recognition (identification of hazards and understanding of their effects on health of humans and their well-being), evaluation (characterization of hazards from qualitative and quantitative points of view) and control/preventive measures) of hazards that arise in or out of the workplace and may cause impaired health or significant discomfort among workers or inhabitants of the surrounding community".

Role and function of occupational hygiene

Safety usually refers to the accident prevention and hygiene to the prevention of diseases or discomfort. This difference between safety and hygiene, although useful in designing different fields of knowledge, may also appear somewhat arbitrary. Safety may not be limited to fire, explosion or accident prevention and may encompass also prevention of long term hazards leading to chronic diseases. On the other side, occupational hygiene may include in its activities: fire, explosion or accident prevention and certainly includes the control of acute risk such as intoxication, narcosis or strong irritation which are accidents. Occupational medicine has the same objectives as occupational hygiene (protection of the workers' health) and uses a complementary approach by focusing its attention onto the worker in order to insure that his or her job fits his or her specific physiological and psychological conditions and will not impair his or her health with time.

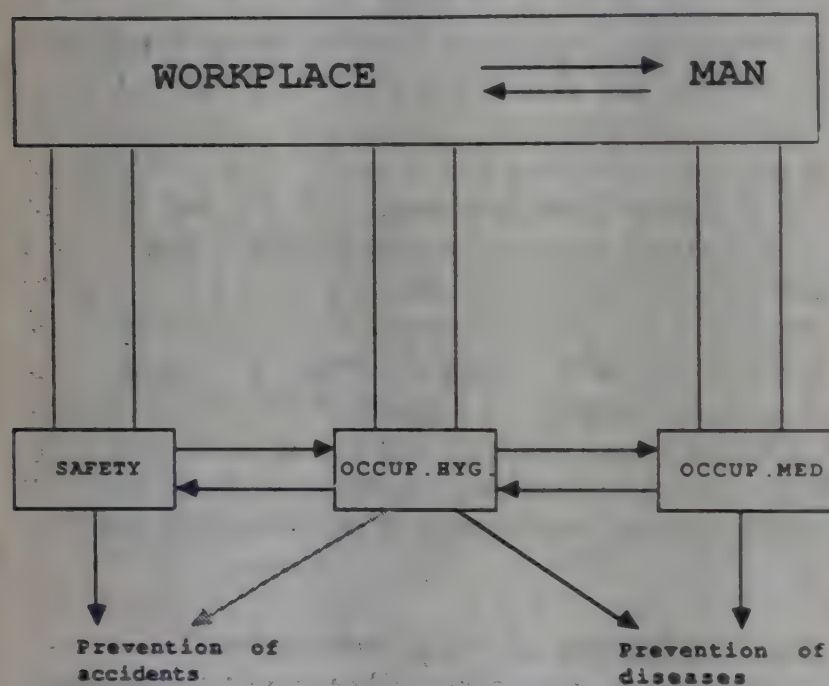
From this it is clear that occupational hygiene holds quite a privileged position in the multidisciplinary team in charge of controlling and managing the hazards in the chemical industry. The occupational hygienist who focusses his/her attention onto the workers' environment finds in the occupa-

* Paper presented at the IUPAC-Workshop on Safety in Chemical Production, September 9-13, 1990.

tional physician the necessary partner to reach their common goal. He is also a privileged partner of the other persons in charge of safety or environmental protection since the problems encountered in the occupational environment often concern simultaneously hygiene, safety and ecology. In other words, the occupational hygienist plays an important role of coordination between the different disciplines of such teams and may also act as a catalyst to the cross-fertilization which occurs in a multidisciplinary approach of the problems.

Figure 1 illustrates one of the aspects of the privileged position of occupational hygiene in the field of workers' health protection².

Fig. 1 Framework of the worker's health protection



Scope and function of occupational hygiene is obviously not limited to the three steps described above but include a lot of other important tasks as advice on planning and organization of work, participation in the development of programs to improve the workplace conditions, training and education of all the people involved, dissemination of information, etc.³.

The role of occupational hygiene in the process of risk assessment and in the field of risk management is determining and essential in the chemical industry because the majority of the hazards are of chemical nature and concern the problems specific to that science which is obviously the most appropriate to keep these risks under control.

Basic approach of a specific problem

By the way of typical situation in a chemical industry we will illustrate how an occupational hygienist will approach a given problem. It should be stressed again that this example will only present a few very limited aspects of the role of an occupational hygienist. The situation to investigate is the production of a chemical in a typical production line con-

sisting of different vessels (mixture, reaction,...) and unit operations (filtration, drying,...). The problem to solve is to know the health risk due to chemicals for the workers occupied with this production in its normal use (abnormal events or accidents being another problem here) is acceptable or not.

Anticipation-recognition

The hygienist must gain accurate knowledge about the manufacturing process and collect information about all the chemicals involved in this production including by-products, impurities, wastes etc. Besides the usual physical and chemical properties of the substances such as flash point, explosive limits, flammability, evaporation rate, vapour pressure and so on, other useful informations should also be collected (Table 1), as well as an estimation of the amounts involved

Table 1
Useful informations related to chemical substances for assessing their health risk

Acute	Chronic
Minimum anesthetic concentration	Solubility in water and fat (oil)
Irritation threshold	Metabolism pathways/clearance routes
Chemical reactivity	Pharmacokinetic/pharmacodynamic data
Odor threshold	Permissible exposure level, biological exposure indices
Level immediately dangerous to health	Acceptable daily intake
Short term exposure limit
Lethal dosis	
.....	

Note: Some information may be related to both acute and chronic risks

Through careful observations and surveys of the workplaces, through qualitative preliminary hazard analysis and with the help of all the other relevant information available (inspection or audit reports, incident or accident statistics and analysis, routine monitoring of the process, medical information about the workers, etc.), the hygienist and his team composed of the concerned person (production manager, occupational physician, chemist, process engineer, foreman, etc.) will identify the workplaces where potential health risks do exist.

This first step may be quite difficult to achieve, but is of utmost importance since any undetected hazard will remain

workers (failure of the prevention).

Situation-risk assessment

In our example, the risk assessment will rely on the exposure assessment since we have restricted the problem to the chemical hazards. The hygienist will use his/her professional judgement for each situation with a potential health risk, to determine if the risk is obviously so low that it can be accepted without further investigations or if it is obviously high that immediate corrective action is needed. For all other situations where a clear decision cannot be taken, the risk (exposure) has to be evaluated. Three methods come into consideration for this evaluation.⁴

1. **Ambient monitoring** is the measurement and assessment of agents at the workplace to evaluate ambient exposure and health risk compared to an appropriate reference

2. **Biological monitoring** is the measurement and assessment of workplace agents or their metabolites either in tissues, secretions, excreta, expired air or in any combination of these to evaluate exposure and health risk compared to an appropriate reference

3. **Health surveillance** is the periodic medico-physiological examinations of exposed workers with the objective of protecting health and preventing occupationally related disease.

These three methods have their own advantages and limitations and should be used simultaneously whenever possible. However, it should be emphasized that the biological monitoring is, at the moment, limited to a few agents (approximately less than 40). The health surveillance carried out by the occupational physician is a very important part of the risk assessment because it allows to detect early reversible signs of health effects or biological response (when the appropriate tests and medical investigations have been selected) which may occur in sensitive individuals or in situations where a complex exposure pattern has produced unexpected synergistic effects.

The hygienist's skill for ambient exposure assessment will be used here to set up an appropriate sampling strategy including the selection of an adequate analytical method or the use of a reliable direct reading instrument.

The choice of the sampling method (either stationary or personal), the duration of the sampling, the number of workers involved, the location of the fixed stations, the type of data handling, the possible external and internal interactions, the pharmacological and toxicological properties of the considered chemical, the relevance of the chosen index to mon-

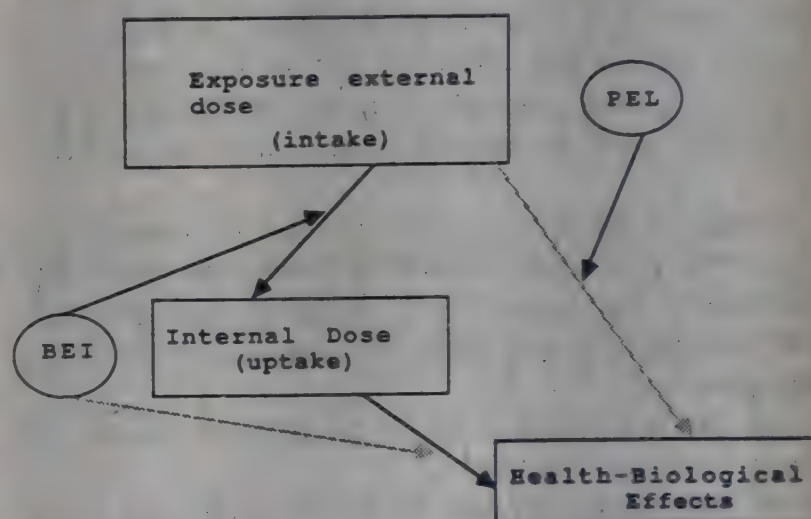
etc. will be taken into consideration in this very critical phase of the risk assessment⁵. The possibility of skin resorption and ingestion through contaminated skin (fingers, lips) has to be taken into consideration in order to assess the internal dose received by the worker. This is where the biological monitoring may be quite helpful.

Figure 2 summarizes the interrelationships between the three monitoring methods and their usual associated "reference values". Permissible exposure level (PEL) and Biological Exposure index (BEI) are usual "reference values".

Figure 2

Interrelationship between the different monitoring methods

Permissible exposure level (PEL) and Biological Exposure index (BEI) are usual "reference values".



When the exposure has been reliably assessed the health risk has to be evaluated to know if it can be considered as acceptable or not. When an "appropriate" reference value does exist, such as a permissible exposure level or a biological exposure index (which may be a legal requirement or a simple recommendation), the interpretation is rather easy since this value represents the acceptable risk. But even in these "simple cases" the collaboration with a physician is necessary to take into account the numerous factors which can play a role in assessing the health risk for a given individual (physiological characteristics, like style, drugs consumption, health status, and so on).

In the other cases, where the reference value is not straightforward an estimation may be done by an extrapolation of the other reference values or of the toxicological data such as "Acceptable Daily Intake" (ADI) "No Observable Exposure Level" (NOEL), "Lethal Concentration" (LC) "Immediately Dangerous to Life or Health" (IDLH) levels, etc. To derive an acceptable risk from these values is a difficult task; requires good knowledge in toxicology and should

also be done as a team work after careful considerations and keeping in mind that such assessment will derive much more "fragile" reference values than those based on good epidemiologic studies. Our knowledge in this field being yet very poor, a reliable risk assessment becomes rapidly impossible in case of complex mixtures where no information is available about the health effect of this precise mixture or about the possible external and internal interactions (synergism, antagonism,). Prevention, in these cases, implies to minimize the exposure as much as practically possible.

Control and risk-management

If the risk has been found unacceptable, it must be either eliminated (change of substances or process) or diminished to an acceptable level. This "sanitation" phase is again a team work where the occupational hygienist plays quite an important role. The possibilities to limit the exposure of the workers are usually numerous and should be chosen according to their best cost/benefit ratio. Automation, enclosure, ventilation, are among the usual preventive measures. The hygienist will test their efficiency and set up a maintenance programme as well as periodic or continuous monitoring programme to insure an adequate protection of the workers.

In some countries, such as in the USA, the occupational hygienists recommend to consider half the permissible exposure value as the "action level". In other words above this level, sanitation has to be done. This strategy is based on two important facts:

1. exposure assessment is not always perfectly reliable and higher levels are possible
2. the permissible exposure levels are usually not severe

enough since most of the time they are corrected on the low side (Lowering the PEL).

The risk management⁶ involves much more than the risk assessment and the preventive measures described here, but is out of the scope of this paper.

Conclusion

Through a limited and superficial presentation of a few key elements of occupational hygiene, the invaluable contribution of this discipline for the risk management in the chemical industry has been shown.

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OCCUPATIONAL HYGIENE

An essential component of risk management

M. GUILLEMIN, University of Lausanne, Switzerland

R. ROTH, Sandoz AG, Basel, Switzerland

Introduction

Hazards in the occupational environment are of multiple nature. Their origins, sources, impacts and consequences on life, health or material may be extremely different and sometimes very complex to assess or to anticipate. The control and the management of these hazards require such a large amount of knowledge and experience in various fields that a multidisciplinary team approach is necessary.

This paper will present the nature and the role of the science called "occupational hygiene" in the general framework of risk management in the chemical industry. It should be stressed that such a presentation cannot be comprehensive and will be limited to a few relevant key elements aiming at the illustration of the importance and the usefulness of occupational hygiene in the management and control of hazards. Focus on chemical hazards appears to be appropriate in this context but does not mean that occupational hygiene is restricted to these ones. The purpose of this paper is to provide the "educators" in the chemical industry or in universities with a simple document introducing occupational hygiene as a necessary tool for managing health and safety in the chemical production.

Definition of occupational hygiene

The International Association of Occupational Hygienists (IOHA) has adopted the following definition:

"Occupational Hygiene is the discipline of anticipating, recognizing, evaluating and controlling health hazards in the working environment with the objectives of protecting worker health and well-being and safeguarding the community at large". This definition helps to understand which type of hazards may be controlled and managed by this science and by which approach. In principle, these hazards and stresses should be measurable so that they may be objectively assessed and evaluated as far as their health risk (both acute and chronic) is concerned. The basic approach described in this definition is divided in three major steps:

1. anticipation/recognition (detection)
2. evaluation (assessment)
3. control (correction or prevention).

Moreover this definition stresses that occupational hygiene is also concerned by the community as a whole. This means

that the control of pollutants and hazards inside the factory must take into account the protection of the environment by eliminating (substitution, retention, destruction) the potential air, water or soil contaminants at their source instead of emitting them in the environment. An appropriate risk analysis and hazard evaluation at the workplaces will also help to avoid catastrophic events and therefore will protect the surrounding population. This important aspect of occupational hygiene has often been underestimated.

"Occupational hygiene is a science which protects both the workers and the environment". According to a document of the World Health Organization¹, "an occupational hygienist is a person with a university degree in engineering, physics or chemistry or an equivalent science degree (in some countries, medicine), and, in addition, with specialized training in recognition (identification of hazards and understanding of their effects on health of humans and their well-being), evaluation (characterization of hazards from qualitative and quantitative points of view) and control/preventive measures) of hazards that arise in or out of the workplace and may cause impaired health or significant discomfort among workers or inhabitants of the surrounding community".

Role and function of occupational hygiene

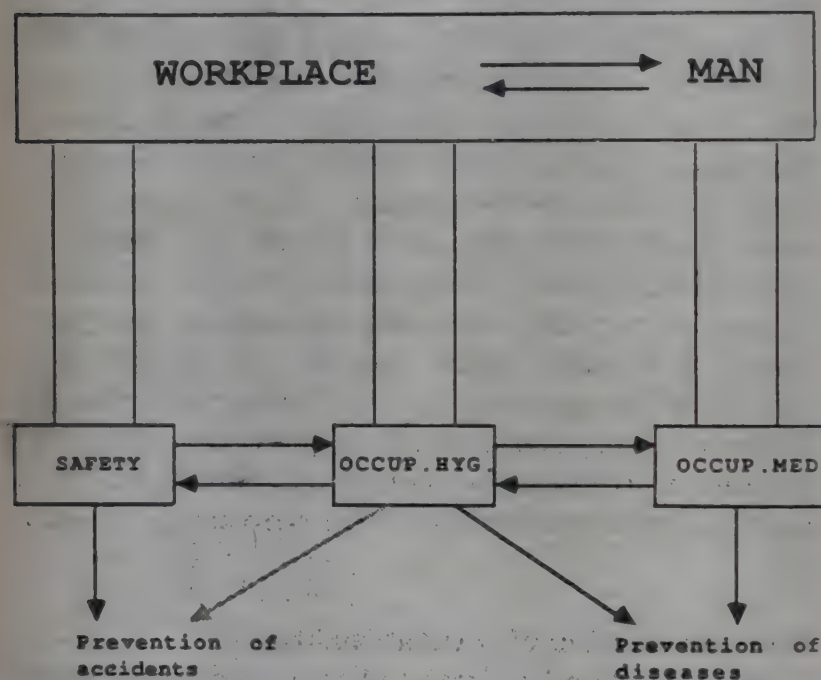
Safety usually refers to the accident prevention and hygiene to the prevention of diseases or discomfort. This difference between safety and hygiene, although useful in designing different fields of knowledge, may also appear somewhat arbitrary. Safety may not be limited to fire, explosion or accident prevention and may encompass also prevention of long term hazards leading to chronic diseases. On the other side, occupational hygiene may include in its activities: fire, explosion or accident prevention and certainly includes the control of acute risk such as intoxication, narcosis or strong irritation which are accidents. Occupational medicine has the same objectives as occupational hygiene (protection of the workers' health) and uses a complementary approach by focusing its attention onto the worker in order to insure that his or her job fits his or her specific physiological and psychological conditions and will not impair his or her health with time.

From this it is clear that occupational hygiene holds quite a privileged position in the multidisciplinary team in charge of controlling and managing the hazards in the chemical industry. The occupational hygienist who focusses his/her attention onto the workers' environment finds in the occupa-

tional physician the necessary partner to reach their common goal. He is also a privileged partner of the other persons in charge of safety or environmental protection since the problems encountered in the occupational environment often concern simultaneously hygiene, safety and ecology. In other words, the occupational hygienist plays an important role of coordination between the different disciplines of such teams and may also act as a catalyst to the cross-fertilization which occurs in a multidisciplinary approach of the problems.

Figure 1 illustrates one of the aspects of the privileged position of occupational hygiene in the field of workers' health protection².

Fig. 1 Framework of the worker's health protection



Scope and function of occupational hygiene is obviously not limited to the three steps described above but include a lot of other important tasks as advice on planning and organization of work, participation in the development of programs to improve the workplace conditions, training and education of all the people involved, dissemination of information, etc.³.

The role of occupational hygiene in the process of risk assessment and in the field of risk management is determining and essential in the chemical industry because the majority of the hazards are of chemical nature and concern the problems specific to that science which is obviously the most appropriate to keep these risks under control.

Basic approach of a specific problem

By the way of typical situation in a chemical industry we will illustrate how an occupational hygienist will approach a given problem. It should be stressed again that this example will only present a few very limited aspects of the role of an occupational hygienist. The situation to investigate is the production of a chemical in a typical production

sisting of different vessels (mixture, reaction,...) and unit (filtration, drying,...). The problem to solve is to know if the health risk due to chemicals for the workers occupier with this production in its normal use (abnormal event or accidents being another problem here) is acceptable or not.

Anticipation-recognition

The hygienist must gain accurate knowledge about this manufacturing process and collect information about all the chemicals involved in this production including by-products, impurities, wastes etc. Besides the usual physical and chemical properties of the substances such as flash point, explosive limits, flammability, evaporation rate, vapour pressure, and so on, other useful informations should also be collected (Table 1), as well as an estimation of the amounts involved.

Table 1
Useful informations related to chemical substances for assessing their health risk

Acute	Chronic
Minimum anesthetic concentration	Solubility in water and fat (oil)
Irritation threshold	Metabolism pathways/clearance routes
Chemical reactivity	Pharmacokinetic/pharmacodynamic data
Odor threshold	Permissible exposure level, biological exposure indices
Level immediately dangerous to health	Acceptable daily intake
Short term exposure limit
Lethal dosis	
.....	

Note: Some information may be related to both acute and chronic risks

Through careful observations and surveys of the workplaces, through qualitative preliminary hazard analysis and with the help of all the other relevant information available (inspection or audit reports, incident or accident statistics and analysis, routine monitoring of the process, medical information about the workers, etc.), the hygienist and his team composed of the concerned person (production manager, occupational physician, chemist, process engineer, foreman, etc.) will identify the workplaces where potential health risks do exist.

This first step may be quite difficult to achieve, but is of utmost importance since any undetected hazard will remain

the workers (failure of the prevention).

Evaluation-risk assessment

In our example, the risk assessment will rely on the exposure assessment since we have restricted the problem to the chemical hazards. The hygienist will use his/her professional judgement for each situation with a potential health risk, to determine if the risk is obviously so low that it can be accepted without further investigations or if it is obviously high that immediate corrective action is needed. For all other situations where a clear decision cannot be taken, the risk (exposure) has to be evaluated. Three methods come into consideration for this evaluation.⁴

A. Ambient monitoring is the measurement and assessment of agents at the workplace to evaluate ambient exposure and health risk compared to an appropriate reference

B. Biological monitoring is the measurement and assessment of workplace agents or their metabolites either in tissues, secretions, excreta, expired air or in any combination of these to evaluate exposure and health risk compared to an appropriate reference

C. Health surveillance is the periodic medico-physiological examinations of exposed workers with the objective of protecting health and preventing occupationally related disease.

These three methods have their own advantages and limitations and should be used simultaneously whenever possible. However, it should be emphasized that the biological monitoring is, at the moment, limited to a few agents (approximately less than 40). The health surveillance carried out by the occupational physician is a very important part of the risk assessment because it allows to detect early reversible signs of health effects or biological response (when the appropriate tests and medical investigations have been selected) which may occur in sensitive individuals or in situations where a complex exposure pattern has produced unexpected synergistic effects.

The hygienist's skill for ambient exposure assessment will be used here to set up an appropriate sampling strategy including the selection of an adequate analytical method or the use of a reliable direct reading instrument.

The choice of the sampling method (either stationary or personal), the duration of the sampling, the number of workers involved, the location of the fixed stations, the type of data handling, the possible external and internal interactions, the pharmacological and toxicological properties of the considered chemical, the relevance of the chosen index to mon-

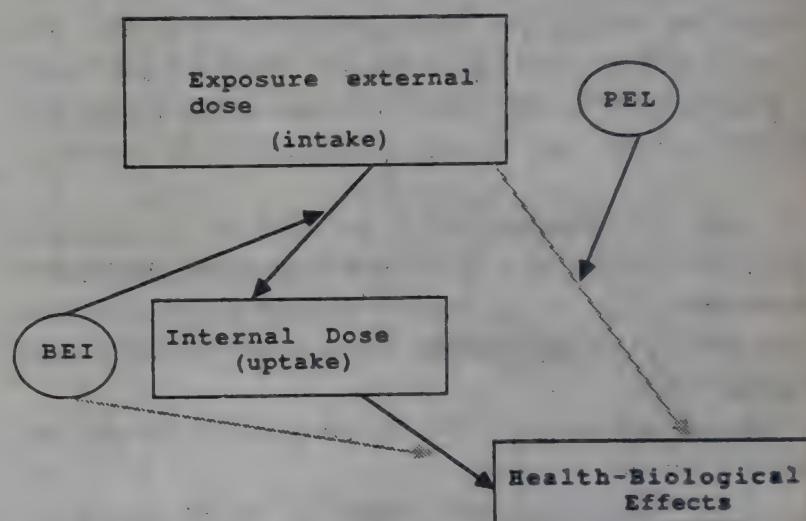
etc. will be taken into consideration in this very critical phase of the risk assessment⁵. The possibility of skin resorption and ingestion through contaminated skin (fingers, lips) has to be taken into consideration in order to assess the internal dose received by the worker. This is where the biological monitoring may be quite helpful.

Figure 2 summarizes the interrelationships between the three monitoring methods and their usual associated "reference values". Permissible exposure level (PEL) and Biological Exposure index (BEI) are usual "reference values".

Figure 2

Interrelationship between the different monitoring methods

Permissible exposure level (PEL) and Biological Exposure index (BEI) are usual "reference values".



When the exposure has been reliably assessed the health risk has to be evaluated to know if it can be considered as acceptable or not. When an "appropriate" reference value does exist, such as a permissible exposure level or a biological exposure index (which may be a legal requirement or a simple recommendation), the interpretation is rather easy since this value represents the acceptable risk. But even in these "simple cases" the collaboration with a physician is necessary to take into account the numerous factors which can play a role in assessing the health risk for a given individual (physiological characteristics, like style, drugs consumption, health status, and so on).

In the other cases, where the reference value is not straightforward an estimation may be done by an extrapolation of the other reference values or of the toxicological data such as "Acceptable Daily Intake" (ADI), "No Observable Exposure Level" (NOEL), "Lethal Concentration" (LC), "Immediately Dangerous to Life or Health" (IDLH) levels, etc. To derive an acceptable risk from these values is a difficult task, it requires good knowledge in toxicology and should

also be done as a team work after careful considerations and keeping in mind that such assessment will derive much more "fragile" reference values than those based on good epidemiologic studies. Our knowledge in this field being yet very poor, a reliable risk assessment becomes rapidly impossible in case of complex mixtures where no information is available about the health effect of this precise mixture or about the possible external and internal interactions (synergism, antagonism,). Prevention, in these cases, implies to minimize the exposure as much as practically possible.

Control and risk-management

If the risk has been found unacceptable, it must be either eliminated (change of substances or process) or diminished to an acceptable level. This "sanitation" phase is again a team work where the occupational hygienist plays quite an important role. The possibilities to limit the exposure of the workers are usually numerous and should be chosen according to their best cost/benefit ratio. Automation, enclosure, ventilation, are among the usual preventive measures. The hygienist will test their efficiency and set up a maintenance programme as well as periodic or continuous monitoring programme to insure an adequate protection of the workers.

In some countries, such as in the USA, the occupational hygienists recommend to consider half the permissible exposure value as the "action level". In other words above this level, sanitation has to be done. This strategy is based on two important facts:

1. exposure assessment is not always perfectly reliable and higher levels are possible
2. the permissible exposure levels are usually not severe

enough since most of the time they are corrected on the low side (Lowering the PEL).

The risk management⁶ involves much more than the risk assessment and the preventive measures described here, but is out of the scope of this paper.

Conclusion

Through a limited and superficial presentation of a few key elements of occupational hygiene, the invaluable contribution of this discipline for the risk management in the chemical industry has been shown.

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International Market Update

TAKEOVER OF TIOXIDE COMPLETE

ICI has acquired the 50% stake of the Tioxide group, in Tioxide, the second largest producer of Titanium dioxide in the world (DuPont is the largest). ICI reported to have obtained the shares at a song but faces the prospect of spending as much as £250 million in running up several plants and updating technologies with all but one of Tioxide's plant based on the older sulphate route, putting it at an disadvantage against DuPont, whose plants are based on the more acceptable chloride route.

Fortunes in the titanium dioxide business have been fluctuating and the outlook in the medium term is only optimistic. Worldwide capacity for titanium dioxide, under the Tioxide model is around 510,000 mt/year with plants located in U.K. (2), Europe (1), North America (1), South Africa (1), Malaysia (1) and New Zealand (1).

PLASTICS ON THE RISE

Increasing prices of feedstocks viz. ethylene, propylene, styrene and vinyl chloride have pushed up prices of most thermoplastics from November 1, with further increases anticipated in December. (See Table Below).

Polyethylenes (low density and high density grades) have been increased by

5 cents/lb effective November 1 and polystyrene prices have also been upped by a similar amount.

TITANIUM DIOXIDE PRICES BRING RELIEF TO PAINT INDUSTRY

The paint industry hit hard by rising prices of inputs, particularly solvents has recently seen prices of titanium dioxide known for constant movement upwards, stabilise and even begin to move downward.

Substantial capacity additions over the last few years, coupled with a downturn in markets have meant that US prices have come down to \$1.03 per lb. In continental Europe prices range between DM 4.4-4.5/kg. and in U.K. prices are hovering below £1500/tonne. Far East prices are in the region of \$2000/tonne, for fourth quarter deliveries, and is likely to be the one area which will see sustained growth.

FERTILISER PRICES IN PHILLIPINES REVISED

Fertiliser prices in the Phillipines have seen major revisions upward following the Gulf crisis. Urea recorded the biggest increase (46%) and prices quoted at around \$10.55 for 50 kg. bag. Ammonium sulphate was up 15% to \$5.80 a bag while ammonium phosphate went up by 12.6% to \$9.35 per bag.

SOUTH KOREA ALLEGES DUMPING OF POLYACETALS

Korean Engineering Plastics, having a 70% market of the domestic polyacetal business has accused DuPont, Hoechst-Celanese and Asahi Chemicals of dumping material in the country's first ever anti-dumping investigation. The Korean firm has a capacity to make 20,000 tonne/year of material, while domestic demand is placed at around 18,000 tonnes/year. Another South Korean concern, Lucky is building the country's second polyacetal plant, and markets are expected to hot up.

PVC GROWTH TO LEVEL OFF

Worldwide growth in PVC, will level off to around 3.1%/year in the period 1989-1995 according to a recent study by Tecnon. Five factors will determine the pace and these include: environment, recycling, European markets, the Gulf crisis and new applications.

On the environmental front, PS will attract greater flak, and pressures on PVC will diminish. Recycling will reduce growth and affects will be felt particularly in developed markets. Eastern Europe holds considerable potential for expansion of sales.

Growth is expected to the above average in Latin America (6.9%/year), the Middle East (5.3%/year), Africa (5%/year) and the Asia-Pacific region (4.7%/year). Details are given in table below:

FEEDSTOCKS PUSH PLASTICS PRICES HIGHER (in cents/lb)

	Aug. 22	Sept. 19	Oct. 17	Nov. 1
Low-density polyethylene (film grade)	36-38	36-38	41-43	46-48
High density polyethylene (blow molding)	40-42	40-42	45-47	50-52
Polypropylene (homopolymer injection)	37-40	39-42	39-42	40-44
Polystyrene (general purpose)	48-50	48-50	55-58	59-62
Polyvinyl chloride (pipe grade)	33-36	31-35	33-36	38-40

PVC CONSUMPTION FORECASTS ('000 tonne)

	1990	1992	1994
North America	4020	4175	4355
Latin America	1019	1180	1329
Western Europe	5150	5363	5556
Eastern Europe	1768	1869	1985
Africa	486	535	588
Middle East	350	397	444
Asia-Pacific	3207	3520	3887
Japan	1985	2070	2140
Total	17985	19119	20289

News About New Projects

BASF APPROVES CRACKER IN BELGIUM

In what will be its largest ever capital investment, BASF has decided to go ahead with an \$855 million cracker complex at Antwerp, to produce 600,000 tonne/year of ethylene, 350,000 tonne/year of polymer grade propylene and 220,000 tonnes/year of benzene from an aromatics unit.

The complex to be designed and built by Linde will handle either naphtha or LPG as feedstock. BASF is expected to use 400,000 tonne/year of ethylene at Antwerp itself and pipe the remaining ethylene to other plants in Europe.

Only recently Exxon had announced that it was dropping work on its Mosmorran cracker, explaining that the current economic slowdown did not warrant any further ethylene capacity.

EASTMAN DELAYS PET PROJECT IN U.K.

Eastman Chemicals, USA has postponed its plans to expand capacity of its PET project in the U.K. from 100,000 m.t./year to 200,000 m.t./year. The expansion to have been completed by

1992, will now be delayed, to go onstream end-1992, or early 1993. Uncertainty due to the Gulf crisis has been attributed to be the cause of the postponement. Shell has a similar project on hand, and although work is proceeding on the project, the company has not obtained full approval of the board. Prices of p-xylene and MEG, key raw materials for the polyester business have jumped up sharply since the start of the Gulf crisis.

DU PONT COMPLETES EPDM PILOT PLANT

Du Pont has nearly completely construction of a \$1 million pilot plant for ethylene-propylene-diene-monomer in Texas. The plant will be used to experiment with methods to enhance production rates, alter moisture content and optimise the purity of its *Nordel* hydrocarbon rubber.

SABIC OKAYS MTBE PROJECT

SABIC, has approved National Methanol Co's, plans to build a 500,000 m.t./year MTBE plant in collaboration with Hoechst-Celanese and Texas Eastern. The board of SABIC has also approved Saudi European Petrochemi-

cal Co's plans to double MTBE output to 1 million m.t./year. However bids for Eastern Petrochemicals linear density polyethylene plant has been off by three months to early 1993. SABIC also confirmed plans to go ahead with a 200,000 tonne/year grafted polypropylene project, based on Union Carbide's Unipol process.

PAKISTAN PLANNING ALCOHOL BASED PS FACILITY

Polymers and Petrochemicals Pakistan has approved plans to set up a 20,000 tonne styrene plant and a 15,000 tonne polystyrene plant. Ethylene will be through ethanol from molasses and part benzene will be from local sources and the balance imported. The project, the first of its kind, will be partially financed by the Asian Development Bank and will go onstream by mid-1993. The plant is expected to fully cater to local requirements of PS.

THAILAND TO BUILD EPOXY RESINS UNIT

Thai Epoxy and Allied Products Co plans to build a 10,000 tonne/year unit to make epoxy resins. The company is a joint venture between the Birla group companies and the Japanese Companies, Tohto-Kasei and Nissin Iwai. The unit is scheduled to go onstream in early 1992.

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Environment

CONGRESS PASSES CLEAN AIR ACT

The U.S. Congress has recently passed a new Clean Air Act, which will impose new controls on ozone-depleting chemicals, air toxics and acid rain. Sulphur dioxide emissions will be cut in half by 2000 AD, to 10 million tonnes annually; and nitrogen oxide emissions reduced by 33% to 4 million tonnes annually, starting 1992. Coal burning facilities will have to spend \$ 3 billion a year to burn low sulphur fuel or install scrubbers to comply with the provisions.

Passenger cars will have to emit 60% less nitrogen oxides and 40% less hydrocarbons starting 2003. This would require installation of catalytic converters in almost all cars and oil companies would have to develop new products, pushing up fuel costs.

The output of 189 toxic chemicals are proposed to be reduced 90% by 2003, and most manufacturers would have to invest heavily in pollution control equipment. Even small businesses such as drycleaning shops and auto repair shops will have to install pollution control equipment.

CFC's and most other ozone destroying chemicals will have to be phased out by 2000. Refrigeration and air-conditioner manufacturers, users of industrial solvents and makers of foam insulation — will have to pay more for substitutes. While EPA estimates the total cost to industry at \$ 25 billion/year, the Chemical Manufacturers Association places the cost at \$40-\$50 billion/year.

Impact on Chemical Industry

Most of the impact on the chemical industry will come from the move to control 189 toxic or carcinogenic chemicals through the installation of Maxi-

mum Achievable Control Technology (MACT) during the next ten years. The EPA will set MACT levels at the average of the cleanest 12% of plants in each of several categories, and how these categories are to be determined is expected to have profound impact especially on small plants. One provision allows companies to avoid the MACT requirement by cutting air toxics at least 90% from 1987 levels by 1994.

The next stage of the clean-up calls for a study by the National Academy of Sciences, to determine the need of clean-up of residual risk, followed by additional measures to control risk to a level probably of 1 in 10,000 initially leading finally to a risk of 1-in-1 million.

GREENPEACE SUES ALBRIGHT & WILSON

In the first private action against a chemical company for environmental violations, Greenpeace has sued Albright & Wilson (London) for violating provisions of the Water Act of 1989. Greenpeace has charged that Albright & Wilson's detergent plant has released effluents containing high concentrations of four metals — copper, chromium, zinc and nickel, much in excess of consent levels. The company has replied that while concentrations of these metals in effluents were indeed higher, the total quantity of effluents still remained within permissible limits. Concentrations, the company claimed were higher since the dilution of waste streams had been contained following a water shortage. Greenpeace sources indicated that similar action was being contemplated on other firms in the U.K. as well.

ICI STARTS UP CFC REPLACEMENT FACILITY

ICI chemicals and polymers (Runcorn, U.K.) has begun production of

MFC-134a, a substitute for CFC-12, at its plant in Runcorn, U.K., as part of a worldwide program to reduce CFC production. The company is building a much higher capacity plant in the U.S., and claims that its CFC production are 25-30% lower than levels required by the Montreal Protocol.

Meanwhile, ICI (USA) has put on hold further research into a bromine-based product 124B1, a new halon-alternative fire extinguisher, till the implications of the recently passed Clean Air Act by U.S. Congress becomes clearer.

EC PLANS TO TAX CARBON EMISSIONS

Plans to tax carbon emissions are being drawn up in Brussels as part of an ambitious EC environmental package to be unveiled next month.

Proposals for the first "green" fund financed from the EC budget, fiscal incentives to combat pollution, and an "ecolabelling" scheme for goods which meet high standards of environmental protection are among other measures being prepared.

Mr. Carlo Ripa Di Meana, the EC Environment Commissioner, is said to be determined to win commission approval for the ideas which he hopes will provide the foundations of his policy for the second half of his four-year mandate. All would subsequently need member state support.

Most of the issues have been under consideration for some time, but a significant spur to action was provided last month when the 18 nations of the EC and EFTA committed themselves to stabilising carbon dioxide and other greenhouse gases by the year 2000.

EC environmental experts believe that introduction of an energy tax is essential if this target is to be met. They argue that the current high oil price

presents an ideal opportunity. Full details of the plan have not yet been settled but one idea is that the tax would be increased as energy prices fall back closer to their pre-Gulf crisis levels. It would be related to the quantity of carbon emitted, so that for example coal would be more heavily penalised than oil, and oil would be hit harder than gas.

Other internal Brussels negotiations — concerning plans for a registration tax on lorries and a variable purchase tax on cars, related to their petrol consumption — are also at a delicate stage. Officials recognise that these proposals could trespass on member states' jealously guarded sovereignty in the area of taxation.

The other two planks of the package, now taking shape — the EC environment fund and the eco-labelling scheme — will probably proceed through the commission with less debate. The fund idea has been a hobby horse of Mr. Ripa Di Meana, who seized on a proposal from the European parliament, in recent budget talks.

The ecolabelling scheme, meanwhile, has already been the subject of intense consultations with industry. It would involve the award of a kind of "green" badge for a restricted number of products that meet high environmental standards, on the lines of a scheme running in Germany. Food and pharmaceutical products would not be eligible, and makers of dangerous substances would also be excluded.

S.E. ASIA SHOWS THE WAY IN PHASING OUT CFCs

South-East Asia's newly industrialising countries are showing the way on phasing out ozone-depleting chlorofluorocarbons (CFCs) by announcing ambitious plans to switch to alternate chemicals. Beginning February 5, 1991, Singapore's Environmental Ministry will enforce a ban on the use of non-pharmaceutical aerosol products con-

taining CFCs -- the chemicals that harm the earth's atmospheric ozone and enhance global warming.

The ban will include household products ranging from hair sprays to furniture polish. Even disposable crockery and wrappings using polystyrene-containing CFCs are out.

CFCs are used worldwide in refrigeration, cleaning and air conditioning. Attempts to get the world's major producers and users of CFCs to cut back have got snagged in debates about compensation to third world countries to make the transition to safer, but more expensive technologies.

Singapore has Asia's highest per capita income after Japan, and neighbouring resource-rich Malaysia has living standards nearly the same as Uruguay. Although major chemical manufacturers in Singapore have already come up with their own range of CFC-free products, effective substitutes for pharmaceutical use are less easily available. Two types of pharmaceutical aerosol sprays are exempt from the ban. Only 1.5 per cent of the world's tonnage of CFCs are used in medicines, according to the United Nations Environment Programme (UNEP).

Critics say Singapore is taking the easy way out. Aerosols consume just five per cent of the total CFC's used in the country. Industry, especially electronics, use up to 50 per cent — largely for cleaning purposes. Singapore and Malaysia are major centres for transnational semi-conductor firms which have used the region's cheaper but highly-skilled labour for production of micro-circuits.

As for air-conditioning and refrigeration (35 per cent CFC consumption), substitutes for the former systems of less than 250 tonnes capacity, is available. But there isn't any alternative yet for CFC used in vehicle air conditioners. There has been progress in other areas.

Singapore companies can now plug in Ozonet — a computerised database designed to give CFC users information on substitute processes, materials and technologies.

Singapore's Economic Development Board has said it will give financial assistance to firms that seek to modify equipment or production processes to conserve CFCs or adjust to substitutes. The Institute of Standards and Industrial Research is also providing consultancy services for analysing and evaluating CFC substitutes and non-CFC processes.

Neighbouring Malaysia is to receive \$10 million from the \$240 million fund set up in Montreal to help the third world make the transition to CFC-free technologies. Malaysian officials have pointed out that the biggest gain from the proposed centre is that the "research results will be available to all instead of being the property of a few whose motive is to make a profit out of poor countries".

Concern in Malaysia has hinged on the lower life expectancy likely to result from ozone depletion. Noted skin specialist M. Ilyas of the University of Science in Kuala Lumpur says darker skin pigments have given people in the tropics a false sense of protection from the softer-effects of atmospheric ozone destruction.

Ozone depletion will allow in more ultra-violet rays, and scientists say this will lead to increased incidence of skin cancer. The Science, Technology and Environment Ministry of Malaysia is currently conducting a national study to identify current and future needs of CFCs and explore technology options and substitutes.

RICE FARMING LEADS TO POLLUTION PROBLEM

Rice is not only the staple food for nearly 3.7 billion people in the deve-

ng world, but its cultivation is owing up lot of pollution problems, entists at the recently concluded posium on rice research—new fron- s said.

The International Rice Research titute (IRRI) in Phillipines was nching a major project with the envi- mental protection agency (EPA) of ited States to evolve methods for iminising environmental fallouts of e cultivation, IRRI Director-General, . Klaus Lampse, said.

Dr. Lampse, told the symposium, organised by the directorate of rice search, that the challenge before sci- tists was to ensure sustainable high elds and prevent rice from becoming e cause for deforestation and air pol- tion.

75 per cent of the fertilisers used in ce cultivation contributed more to pol- tion than improving yields, he pointed ut. Suggesting minimising pesticide se, he cited Indonesia, which banned 0 pesticides and reduced their use in ce cultivation without loss on produc- on.

IRRI had banned all the pesiticides hat had been categorised as hazardous o humans on its field trials, even though ome of them could be useful to the lants, Dr. Lampse said, adding that imilar steps should be taken in devel- ping countries. IRRI would initiate nternational level consortiums with rice rowing countries to tackle various pro- lems confronting rice cultivation as well as evolving methods for maximis- ng yields through emerging technolo- ies like genetic engineering, he said.

Our efforts should be aimed at mproving rice production drastically to educe water, air and soil pollution. Today almost 75 per cent of fertilisers used in irrigated rice were converted into methane and carbon dioxide emis- ions.

HUMAN RACE FACING ENVIRON DISASTER

The human race is on a collision course with the environment and both could be destroyed, an International Conservation Conference in Australia was told.

"The signs of danger are everywhere, from the highest atmosphere to the ocean deeps and tropics to the poles", said Martin Holdgate, head of the World Conservation Union.

"The human race is on a collision course with the environment", he told delegates to the conference. "If we destroy nature we destroy ourselves", said Holdgate, citing damage to the earth's ozone layer, industrial pollution, over-use of agricultural chemicals, and a world population doubling to 10 billion by early next century.

Holdgate, a British zoologist and scientist specialising in the environment, called for an international code of ethics to stop destruction of the environment. This would include more concerted action by Governments to cut the output of chlorofluorocarbons, used in aerosol cans and refrigerators, which create the so-called "Greenhouse effect".

Gases such as carbon dioxide and methane trap heat in the upper atmosphere and destroy the ozone layer.

POLLUTION BUSTERS HEAD FOR THE EAST

Dire warnings have been given by Chris Patten, the UK Environment Secretary, that British exporters could lose out to foreign competitors in the race to capture overseas markets for pollution control equipment.

Britain is in danger of lagging behind in eastern Europe where the market for equipment to clean up the environmental devastation left by the communist regimes is estimated at about £8bn

a year. The hesitancy is understandable. There is shortage of hard currency available to pay for contracts, and legal and commercial confusion during the transition to a free market will remain for some time.

Deals were previously concluded with State Trading Organisations but western businessmen are now faced with a variety of independent organisations and burgeoning companies. "It is no good relying on out of date information about these countries," says Max Hobbs, group marketing director of Insituform Services. "You have to get your willies on and go out there."

His company, which manufactures a new system for repairing pipelines, has already started to penetrate eastern Europe. At the International Environmental Engineering Exhibition in Brno, Czechoslovakia last month, Hobbs was swamped with enquiries.

The company has just repaired two pipelines under Vitava river in Prague which were causing pollution. Under the Insituform system a cylinder is inserted in the damaged pipe and expanded to provide a new lining. The company is now negotiating for a job on sewer pipes at Moscow State University.

Chris Salter, a Director of Just Water, a West Lothian company producing water purification equipment, was surprised at the interest shown in Czechoslovakia. On the first day at Brno he had 50 enquiries. He was interviewed on local radio and his product appeared on the TV news.

The extent of water pollution in Czechoslovakia was clear in Brno itself. Until two week ago residents of this heavily industrialised town were being warned not to drink the water without boiling it.

One of the main needs in eastern Europe is for pollution monitoring equipment. The technology is not avail-

able there for measuring pollution, let alone dealing with it. Openings exist for companies such as VG Instruments, a division of Fisons, which was at Brno with its selling agents Uni-Export Instruments. It provides a whole range of instruments for detecting toxic gas, minute quantities of lead or mercury, impurities in drinking water or applications for soil analysis.

It is not a market for fly-by-nights who come in to make a quick sale. Servicing of equipment is important and the company has service arms in Czechoslovakia and other countries of the region. The need to think long term is stressed by Jan Campbell, Chairman

and Chief Executive of Campbell Concept of Weybridge, Surrey, which specialises in development and investment opportunities in eastern Europe.

Campbell is dealing with a project where the Czechs have developed technology for turning ash into artificial stones. The Czech sponsors are putting up half the money but need a further £100,000 from the West. The Czechs face vast environmental problems. Tall chimneys belch smoke from the sulphurous brown coal which causes acid rain.

In Northern Bohemia near the German frontier whole areas on forest

had been badly damaged by acid rain. Bedrich Moldan, Environment Minister for the Czech Republic emphasises that he would like British companies to establish joint ventures with the Czechs to tackle these problems.

Under the EC PHARE programme financial support for Poland and Hungary is likely to be extended to Czechoslovakia and other eastern European states. It is also hoped to secure funds from the United States Seed (Support for Eastern European Democracy) programme and from the World Bank. "We are now trying to solve problems that were solved in Britain 50 years ago," says Moldan.

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Biotechnology

MONSANTO RENEWS THRUST ON VIRUS RESISTANT PLANTS

Following success in producing virus resistant tomato plants, Monsanto is planning to extend work into introducing viral resistance in peppers and cassava through genetic engineering.

The company is part financing a project in Mexico to make chillies and sweet peppers viral resistant. Some results are expected in the near future, and Monsanto will have rights over the technology once developed.

Monsanto's second involvement is with a joint research project, combining French, German and American teams, to provide genetic resistance into cassava plants against the African cassava mosaic virus, and the cassava common mosaic virus. These viruses reduce

harvests by 10-30% and benefits of any viral resistant strain will be obvious.

ORAL CONTRACEPTIVE MARKET TO DOUBLE

Worldwide markets for oral contraceptives could double in the next three years, with the approval of hormonal contraceptives in Japan end-1991, and the opening up of markets in Eastern Europe and the Soviet Union.

Low dosage versions, will also give a boost to markets following their approval in U.S. markets, end-1991. The current \$1.7 bil. market is led by Wyeth, Ortho, Schering and Organon. Schering has already announced a marketing agreement with Yamanouchi of Japan which will permit it access in this market. The company is also well placed to exploit the [East] German market.

NOVO REPORTS SUCCESS IN OSTEOPOROSIS THERAPY

Kliogest, Novo's hormonal product has been shown in long term clinical trials to significantly reduce the levels of low density cholesterol while leaving the levels of high density cholesterol unaffected. Bone mass also increased opening up possibilities in the treatment of osteoporosis, and to reduce the risk of cardiovascular disease.

US PATENT FOR PROMOTER SYSTEM

DNAP Plant Technology, New Jersey has been awarded a patent for a promoter system that permits enhanced expression of genes genetically introduced into plants.

The promoter is a DNA sequence that determines the amount of protein produced from a specific gene by regulating the conversion of DNA to RNA.

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News from Japan

NISSHO IWAI PLANS 40,000-TON IMPORT OF AUSSIE ILMENITE IN URGENT STEP

Nissho Iwai Corp., will strengthen supply of Australian ilmenite in Japan. As a step meeting the detection of high-density radioactivity from Malaysian ilmenite, this corporation will start the supply of 40,000 tons of ilmenite from the Australian Cable Suns Group, which is now under its control, within this year.

At present the same group is pushing its plan for twofold expansion of ilmenite production. Nissho Iwai, too, has established a policy of securing a lasting and stabilized supply for users at home in accordance with the same plan. Ilmenite, which is material for titanium dioxide, is imported mainly from Malaysia and Australia. At the titanium-dioxide plants and waste-disposal facilities at various places, however, high-density radioactivity has been detected, and it was discovered that the radioactivity had its origin in the ilmenite from Malaysia.

Since then, the titanium dioxide manufacturers in the country have suspended the use of ilmenite from Malaysia. However, demand for titanium dioxide continues to increase rapidly, due mainly to the increasing demand for paint and ink pigment. As a result, the situation has become strained for the manufacturers.

Towards the end of last year Nissho Iwai purchased RZ Mines Group and the Cable Suns Group which had been under the control of PIL of Australia. The latter group is engaged in the mining of titanium and zircon ore, and is turning out 250,000 tons of ilmenite a year. It supplies about 40,000 tons of ilmenite to Japan every year. Because of the recent case of radioactivity detection, it has hastily concluded a new contract to increase supply by 40,000

tons within this year. According to the present schedule, 20,000 tons will be allotted to three companies — including Teika — at first, and the remaining 20,000 tons will be imported towards the end of this year.

Radioactivity is at the level of 130 ppm, or far below the level of 500 ppm said to be less than one-half of the maximum allowable content. So, there is no problem at all, as far as radioactivity is concerned. At present the Cable Suns Group is pushing the Jangerdap project for twofold expansion of ilmenite production. This project will be carried out within several years from now, and annual output will increase to about 500,000 tons.

Nearly 90 per cent of the scheduled output has already been contracted for. Nissho Iwai wants to supply the remaining amount of about 50,000 tons, which has not yet been contracted for, to manufacturers of titanium dioxide at home. This corporation is planning to stabilize the supply over a long period, while maintaining fair prices and high quality.

PHOSPHORIC-ACID MAKERS ADVISED TO STREAMLINE OPERATIONS

The Ministry of International Trade and Industry (MITI) applied in late August the Law on Temporary Measures to Facilitate Industrial Structural Adjustment to wet-process plants for phosphoric acid. In accordance with the special law, phosphoric-acid producers are scheduled to work out streamlining plans and team up with each other as the circumstances concerned demand.

The industry has already conducted its own structural reforms twice under the pressure of dull demand for fertilizer and growing imports of ammonium phosphate — a major outlet for wet-process phosphoric acid. The circumstances surrounding the industry, however,

have deteriorated, further lowering the operation rate of wet-process phosphoric-acid plants. Imports of the product are continuing to rise; they came to 556,681 tons in fertilizer year 1989, up 10.8 per cent over the preceeding year.

Nissan Chemical suspended last June production of phosphoric-acid liquid. It is forecast that phosphoric acid imports will continue to increase from now on. MITI had been preparing to apply the law to the said production facilities from the summer of last year but it took time for it to agree with the Fair Trade Commission with regard to enforcement of the law.

IDEMITSU KICKS OFF PLASTICS MOLDING BUSINESS IN U.K.

Idemitsu Petrochemical Co. is launching into plastics operations in Europe in a team-up with Japanese and local firms. Showa Pla U.K. Ltd. — owned by Idemitsu Petrochemical and Showa Plastics Co. of Japan — recently completed a molding plant for polystyrene (PS), polypropylene and ABS resins in Stafford located near Birmingham, the U.K. and has begun to supply primary and secondary-processing products of these resins to Japanese manufacturers of household electrical appliances operating in Britain. Local demand for the products is growing mainly for use in large-sized color TVs.

The joint firm was established in September last year with Idemitsu Petrochemical owning 45 per cent and Showa Plastics, the rest. The latter is a major Japanese injection molder. With regard to supply of low-material resin, Idemitsu Petrochemical is implementing a plan for building a 50,000-t/y polystyrene plant in Spain in mid-1992 partnership with Repsol Quimica affiliated with Spain's state-run oil firm Repsol. The resin concerned will be supplied to the British subsidiary.

Based on these operations, Idemitsu Petrochemical intends to branch out into

polycarbonate and polypropylene business in Europe with the 1992 EC integration in sight.

The company is intent on pushing ahead with plastics operations overseas. It is producing ethylene, styrene monomer and PS in Malaysia, PS and PC resins in Taiwan, PC in Brazil and PP compounds in North America.

ETHYLENE CAPACITY 5.65 M. T/Y THOUGH SHORTAGE CONTINUES

Japan's production capacity for ethylene as of the end of last August amounted to 5,653,000 tons a year, up 3% over the preceding year: it would reach 6,183,000 tons if producers skipped periodic plant repairs. This is shown in the results of a survey recently conducted by the Ministry of International Trade and Industry.

The product will be in somewhat tight supply this year if it is correct in estimating domestic ethylene demand and the plant operation rate concerned at 5,740,000 tons and 90 per cent, respectively.

On the other hand, however, the capacity is expected to come close to 6 million tons at the end of this year since Showa Denko, Tonen Petrochemical and Idemitsu Petrochemical are planning to build up their ethylene capacities.

In response to brisk demand for petrochemical products, Japanese producers have scaled up their production capacities through debottlenecking.

Ethylene producers, for example, have stepped up production by revamping their crackers: Idemitsu Petrochemical, up 79,000 t/y; Sanyo Ethylene, up 40,000 t/y and Mitsubishi Petrochemical, up 30,000 t/y, etc. Capacity build-up is seen for almost all other petrochemical products excluding acetaldehyde. (See table).

**Production capacity for major petrochemical products
(1,000 t/y)**

Products	At the end of August 1989	At the end of August 1990
Ethylene	5,490	5,653
Low-density polyethylene (L-LDPE)	1,709 (346)	1,878 (388)
High-density polyethylene (incl. co-produced L-LDPE)	1,058	1,118
Polypropylene	1,691	1,965
Ethylene oxide	718	753
Styrene monomer	1,951	2,228
Polystyrene (GP, HP)	1,106	1,189
Acetaldehyde	487	485
Acrylonitrile	592	592
Synthetic rubber (solid)		
SBR	678	681
BR	257	260
IR	110	113

**Ethylene Capacity
(1,000 t/y)**

Company	At the end of Aug. 1989	At the end of August 1990	
		When plant repairs conducted	When plant repairs skipped
Idemitsu Petrochemical	552	631	698
Ukishima Petrochemicals	881	881	972
Osaka Petrochemical	332	337	372
Sanyo Ethylene	400	440	480
Showa Denko	584	584	632
Tosoh	377	377	409
Sumitomo Chemical	358	367	401
Tonen Sekiyukagaku	393	393	428
Maruzen Petrochemical	480	480	525
Mitsui Petrochemical	92	92	100
Mizushima Ethylene	400	400	442
Mitsubishi Petrochemical	642	672	723
Total	5,490	5,653	6,183

WASTE-RECYCLING PLANT TO BE CONSTRUCTED

Clean Japan Centre is scheduled to solicit applications for a new project aimed at building in the next fiscal year

a demonstration plant for waste recycling and assessing its performance. The project intended to recycle refuse and thereby ensure effective use of natural resources has the financial back-up of the Ministry of International Trade and Industry.

The corporation was established 15 years ago by MITI and private sectors with the aim of developing and spreading use of waste-recycling technology.

R&D FOR MACROMOLECULAR SUPER-IONIC CONDUCTOR PLANNED

A study group for macromolecular material having controlled molecular arrays has compiled an interim report claiming the importance of research aimed at creating a macromolecular superionic conductor by modifying conductive polymer using molecular array-control technology. The study group attached to the Association for Progress of New Chemistry has been conducting since the fall of last year feasibility studies on molecular array-controlled macromolecular material. It has begun to consider developing the said conductor as a national project.

As macromolecular ionic conductor is a solid material containing no solvent and enables ionic conduction as in solution. Research on the product has been rapidly progressing since 1973 when a paper on the high-level temperature dependence of the conductivity of polyethylene oxide containing inorganic salt was announced. A macromolecular ionic device is regarded as promising material capable of facilitating the replacement of wet-type ionic devices with dry-type ones.

PRICES FOR AROMATICS-BASED INTERMEDIATES SEEN BEING UPPED

Following Mitsui Toatsu Chemicals and Nippon Kayaku, Hodogaya Chemical also plans to raise prices for benzene/toluene-based chlorides by ¥25-50/kg. effective with November 1 shipments. The company has entered into price negotiations with users.

It attributes the planned price hike to soaring prices for aromatic products — staple raw material — and sharp increa-

ses in distribution/utility costs. It claims it must boost the price if it is to continue production activity and ensure a steady supply of the products.

Targeted products are p-dichlorobenzene, o-dichlorobenzene, benzyl chloride, 2-6 dichlorobenzyl chloride, 2-4 benzyl chloride, p-chlorotoluene, o-chlorotoluene, 2-4 dichlorotoluene and 2-6 dichlorotoluene. The company has already raised prices for aldehydes (benzaldehyde, p-chlorobenzaldehyde and o-chlorobenzaldehyde).

Market prices for aromatics-based intermediates will be upped for certain, since the three major producers are moving towards raising them by all means. As a result, those for end products — dyes and pigments — will also be boosted.

PLASTIC RAW MATERIAL PRODUCTS OUTPUT IN JANUARY-JULY BRISK

Production of plastic raw materials and products has continued to be brisk. According to The Japan Plastics Industry Federation, production of plastic raw materials in the January-July period of this year registered 7,215,672 tons, up 6.6 per cent over the corresponding period of the previous year when the highest figure ever was marked. Production of plastic products came to 3,130,506, up 2.1 per cent over the same period of the previous year.

Regarding production of raw-material resin, melamine resin, polyethylene, EVA, polypropylene, polyamide and polycarbonate each increased by more than 10 per cent over the same period of the preceding year. In particular, an increase in thermoplastic resins apparently supported total production growth. Production of raw-material resin in July registered 1,054,426 tons, exceeding the 1 million-ton level again.

Production of plastic products has also remained favourable. Production in

July came to 464,807 tons, up 3.3 per cent over the same month of the previous year. Combined production in the January-July period recorded a 2.1 per cent rise.

Looking at growth rates by product in the same period, film registered a 0.6 per cent gain (nonrigid up 0.3 per cent; rigid, up 5.4 per cent), followed by sheet (up 5.9 per cent), plates (up 2.9 per cent), synthetic leather (up 5.7 per cent), pipes (unchanged), joints (up 3.3 per cent), machinery, equipment and accessories (up 5.3 per cent), daily needs and sundries (up 0.7 per cent), vessels (up 0.2 per cent), construction materials (up 0.5 per cent), foamed products (up 3.8 per cent) reinforced products (down 3.5 per cent) and other products (up 3.4 per cent).

PRODUCTION OF CHLORINATED XYLENE SLATED: IHARA NIKKEI

Ihara Nikkei Chemical Industry Co. aims to commercialize inhouse-developed chlorinated xylene — the first products of its kind in the world — using a newly built plant having a production capacity of 100 t/m in terms of p-xylene dichloride. A potential application of the new product is functional high polymers.

Chlorinated xylene as well as chlorinated toluene will be the company's major production items. To date the firm has served as a supplier of chlorinated toluene for Kumiai Chemical Industry and the Ihara Chemical group.

SYNTHETIC DYES OUTPUT RISES SHARPLY IN 1990 1ST HALF

Production of synthetic dyes in the January-June period of 1990 came to 37,539 tons, up 7.7% over the same period of the previous year; sales, 35,954 tons, up 6.5%; and sales value, ¥57,200 million, up 9.3%; sales value thus exceeding sales volume in terms of

growth rate. These figures show a very favorable situation. This favorableness steams mainly from the fact that domestic sales rose 8.2% over the same period of the previous year thanks to the briskness of domestic dye processing, which tended to have a dark-color orientation bolstered by the popularity of 'earth colors' seen from the beginning of this year, and the fact that exports, which had broken record highs for third consecutive year, still continue increasing.

Thus, amid favorable conditions, production of almost all items increased. In particular, two major items — dispersed and reactive dyes — showed sharp increase of 10.4 and 21.5%, respectively. The two items combined accounted for 49% of the total.

Exports in the January-July period of 1990 were favorable at 11,945 tons, up 3.2% over the corresponding period of the preceeding year. Record highs are likely to be set for the fourth consecutive year. Export value showed a marked increase of 16% over the same period of the previous year.

Exports to Southeast Asia, which have continued high growth, showed country-by-country changes as illustrated by the fact that those to Korea increased sharply by 19% over the same period of the preceeding year but those to Taiwan, Hong Kong and Thailand decreased by 6, 13 and 6%, respectively. Those to Indonesia, Singapore and the Philippines, though small in volume, showed 45, 43 and 14% gains, respectively, thus showing an upward trend.

Exports to Europe rose 11% in volume and 38% in value and Japanese manufacturers' policy of Europe-orientation thus became clear. The export ratio was 18% by volume and 21% by value.

Imports in the January-June period of 1990 registered 8,688 tons, a 8.2% drop, indicating that the growth trend seen up to the end of 1989 had come to an end.

Imports from Europe took an overwhelmingly large share as usual. Their import volume accounted for 75% of the total and their value, 84%. Imports from Asia showed a sharp decrease of 15% from the same period of the previous year. In particular, those from Taiwan declined by 29%.

SULFURIC ACID OUTPUT, DELIVERIES DROP SLIGHTLY IN APRIL-AUGUST PERIOD

Sulfuric Acid Association of Japan recently issued a report on the supply-and-demand situation for sulfuric acid in the April-August period of 1990.

According to the report, production came to 2,774,000 tons (1.5% drop from same period of previous year) and deliveries, 2,804,000 tons (1.4% drop), thus both showing a slight decrease tendency. Production in August registered 549,000 tons, a drop of about 20,000 tons from the previous month. However, the production level in August is only surpassed by that in August last year and that in August 1983. It can thus be said to be on a considerably high level. Demand recorded 518,000 tons, of which domestic demand registered 474,000 tons. Domestic demand was less than 500,000 tons for the first time in 10 months.

Regarding details of the production, sulfuric acid produced from smelter gas came to 1,634,000 tons (down 1.3% from same period of preceeding year); followed by that produced from pyrites, 227,000 tons (up 1.3%); that produced from sulfur, 806,000 tons (down 1.1%); and other sources, 108,000 tons (down 12.2%). With regard to details of sulfuric acid produced from smelter gas, the mainstay of sulfuric-acid production, sulfuric acid produced as a result of copper smelting registered 1,138,000 tons (down 3.5%) and that produced as a result of zinc smelting, 496,000 tons (up 4.0%).

Deliveries of sulfuric acid for ferti-

lizer use came to 551,000 tons (down 5.8%) and those of sulfuric acid for industrial use, 1,984,000 tons (up 3.2%), giving a total of 2,535,000 tons (up 1.1%). Thus sulfuric acid for industrial use did no better than before in offsetting the sluggishness of fertiliser demand.

Exports at 269,000 tons continued their decline (down 19.7%). Inventories in August rose by about 30,000 tons over the previous month to 189,000 tons due to several companies increasing their inventories in preparation for periodical plant repairs for slated September.

SHOWA DENKO BUILDING UP STYRENE-MALEIMIDE RESIN BUSINESS

Showa Denko K.K. intends to push forward styrene-maleimide resin operations in earnest: the product has high-level flame-retardant properties and strong thermal resistance and demand for it is expanding for use in parts of household electrical appliances.

The company is now exploiting markets for the resin using a 200-t/m semi-commercial plant at its Kawasaki factory. It envisages building a 5-6,000-t/y commercial plant one or two years hence by remodelling the existing batch-process plant. The firm has been intent on building up styrene business. It has ensured a steady supply of styrene-monomer feedstock by consolidating its partnership with Nippon Steel Chemical and started operating last spring a 30,000-t/y plant for HI-grade polystyrene in a team-up with Sumitomo Chemical.

Start-up of the new plant has enabled Showa Denko to develop/produce special styrenic resins using the above mentioned batch-process plant.

For example, it has commercialized in house-developed acrylonitrile-chlorinated-polyethylene-styrene resin.

TSUI PLANS PTA PRODUCTION IN INDONESIA WITH PERTAMINA

Mitsui Petrochemical Industries Ltd. and Mitsui & Co. will set up a joint venture in Indonesia with two local firms to produce purified terephthalic acid (PTA) for polyester fiber.

The joint company, PTA Indonesia, will be capitalized at \$50 million, of which 50 per cent will be provided by Mitsui Petrochemical, 20 per cent by Mitsui & Co., a Japanese trading giant, and 30 per cent by the Indonesian state-owned petroleum and natural gas refining enterprise, Pertamina, and 10 per cent by Pertamina's sales arm, Humass.

The new firm will start building a PTA plant in Aceh, northern Sumatra, next year. The plant will have an annual production capacity of 250,000 tons, and will go into operation late in 1993. PTA Indonesia will start construction work on another plant with the same capacity at about the time the first plant starts operation.

Of the first plant's output, 100,000 tons will be supplied each year to Indonesian users, and 150,000 tons to other countries in Southeast Asia.

Sales in the first year are put at about \$25 billion. PTA demand in Indonesia stands at roughly 220,000 tons a year; it is projected to amount to 500,000 tons a year in 1995.

Pertamina is operating a 150,000-t/y PTA plant using technology introduced from Mitsui Petrochemical. It intends to scale up the capacity to 225,000 tons a year next spring. The Indonesian firm is pushing ahead with a plan for building aromatics plants (p-xylene, 335,000 t/y and benzene, 250,000 t/y). It will supply 170,000 tons a year of p-xylene feedstock to the planned joint venture.

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New Developments from Japan

RAW MATERIAL FOR BIODEGRADABLE PLASTICS SYNTHESIZED

Nard Institute, Ltd. developed new technology for producing 3-hydroxybutyric acid — raw material for biodegradable plastics — from acetic methyl — a common chemical product — using inhouse-developed Raney nickel catalysts. Acetic methyl is so inexpensive that the new process is capable of producing the target material at low cost.

A technical expert at the institute claims: "We are able to supply 3-hydroxybutyric acid monomer at 1,200 (\$7.9-15.8)/kg. "It is possible to produce a wide variety of biodegradable plastics by copolymerizing the monomer with methyl/ethyl/propyl groups. They will probably be priced below ¥4,000 (\$31.6)/kg.

ICI (U.K.) is the only firm in the world to commercialize biodegradable plastics by copolymerizing 3-hydroxybutyric acid obtained from microorganisms with the ethyl group. The natural raw material, however, boosts market prices for the product to approximately ¥5,000 (\$39.5/kg).

There is a chemical-synthesis process designed to produce 3-hydroxybutyric acid by reducing β -naphthol using ruthenium catalysts. This process is, however, unsuitable for mass production since the catalysts are so expensive. Nard has pioneered the said catalyst by removing impurities from ordinary Raney nickel catalysts through ultrasonic cleaning and chemically modifying the resultant product using tartaric acid in a bid to improve its activity.

The purity of 3-hydroxybutyric acid produced using the Nard process stands at roughly 80%, slightly lower than that of biological products. It is still not

therefrom is completely biodegradable but the process has paved the way for chemically synthesizing the raw material for biodegradable plastics.

TAIHEI CHEMICAL UNVEILS WHITE ANTICORROSION PIGMENT

Utilizing its expertise in producing secondary products of phosphoric acid, Taihei Chemical Industrial Co. has formulated a white anticorrosion pigment based on calcium phosphite, and recently begun shipping samples. The new product is reportedly 3-4 times more weather-resistant than conventional white pigments. According to the company, the new pigment was developed as an undercoating substitute for environmentally hazardous chromium substances. As such, it is raising expectations that demand will increase over a wide range of applications.

Taihei Chemical is developing its businesses around the three lines of activated carbon, dental materials, and phosphoric-acid secondary products. Of these, the secondary products account for 75% of the total sales. The company has expanded its base of operations in this field by moving into bioceramics and compound materials for resins, and the recent pigment development is an additional step in this direction.

The white pigment is based on calcium phosphite, which Taihei has been supplying for other applications. The anticorrosion function is obtained by applying an independently formulated process to calcium phosphite and using the deoxidizing capacity of phosphorous acid.

KYOCERA UNVEILS LIGHT-WEIGHT SILICON NITRIDE INTAKE-EXHAUST VALVES

Kyocera Corp. has recently developed silicon nitride intake-exhaust valves for automobile engines and at the

same time formulated a new technology for reducing weight.

Compared with existing silicon nitride used in turbocharger rotors, which Kyocera began supplying in quantity to Toyota Motor Corp. this August, the new material has superior flexural strength and abrasion resistance.

Traditional engine intake-exhaust valves are constructed of heat-resistant steel. But their usage has been restricted to below 7,000 rpm due to severe engine knock above this level. The new ceramic valves, on the other hand, can withstand more than 9,000 rpm, and at a 50% reduction in weight.

So far, Kyocera's new valve has won praise on the racing circuit. The next step is to expand sample shipments to passenger car makers, and with a good evaluation by users, begin commercial production.

OXYGEN ATOMS IN CERAMICS DIRECTLY OBSERVED

National Institute for Research on Inorganic Materials has succeeded for the first time in the world in directly observing oxygen atoms incorporated in ceramic material using a high-performance electronic microscope. The technical breakthrough will, the institute claims, be of great help in elucidating the crystalline structure of oxide-based superconductors.

The microscope was manufactured by Hitachi Ltd. in line with a research project for superconductive material, which is being tackled by Japan's Science and Technology Agency. The device's resolving power and accelerating voltage are 1A and 1,300 KV, respectively: the corresponding values for conventional equipment are 1.6A and 1,000 KV, respectively. The former's magnification is 1.5 million times. Lanthanum hexaboride has been employed for its electron gun.

The abovementioned ceramic material is zirconia (ZrO_2) whose crystalline structure is comparatively simple, thus facilitating oxygen observation. Zirconia is employed as an ionic conductor for an auto-exhaust sensor.

NEW-TYPE SECONDARY CELL FOR LOAD CONDITIONER UNDER DEVELOPMENT

Central Research Institute of Electric Power Industry is pushing forward with development of a new-type lithium cell that may have market potential as the secondary cell of a power-storage load conditioner for household use. The cell has a polyacenic semiconductor (PAS) as the cathode. A load conditioner is a device storing electricity late at night when electricity is not used as much as in the daytime and for discharging it at a time when the power load is high. The device mainly consists of the secondary cell, the AC-to-DC converter and the controller. Successful development of a

suitable load conditioner depends on the development of a secondary cell featuring a high degree of both volume and weight energy density as well as a long cycle life.

According to the institute, the average discharge voltage of the Li-PAS cell within an operating range of 4-2 v measures 2.88 v, volume energy density reaches 120 W/h per litre and weight energy density, 70 W/h per kg — these are slightly higher than the target figures for a load conditioner-use cell. In addition, its energy efficiency reaches 93%, far higher than the initially set target of 80%. In particular, it is noticeable, the institute says, that the new cell has proved to have sufficient capacity for overcharge and overdischarge.

Even so, its cycle life is between 200 and 500 cycles, far below the target of 2,500. As it is known that the life cycle of the cell is dependent on the metallic lithium used as the anode, the institute says it will continue R&D efforts with

emphasis placed on searching for substances to replace the lithium. PAS was originally developed by Kaneno, Ltd and Kyoto University. offered PAS by Kanebo for research, the institute has carried out since four years ago R&D for it for use as the cathode of secondary cell.

CONVERSION OF NATURAL GAS INTO ETHYLENE POSSIBLE

Three corporations are likely to successfully develop a new process aimed at producing ethylene from methane on the strength of an oxygen-coupling reaction. Lithium, magnesium and samarium are candidate carriers for catalysts used for the reaction.

The three are Japan National Oil Corp., Cosmo Research Institute and Japan Petroleum Exploration Co. They have inaugurated this fiscal year a new project intended to facilitate efficient use of natural gas.

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MARKET INFORMATION

MEK Zooms, Phthalic Up

Prices of methyl ethyl ketone (MEK) in the Bombay chemicals market shot up to Rs. 90 during the week under review. Phthalic anhydride also went up to Rs. 58/kg. With little material in the market, prices of MEK touched an all time high of Rs. 90. Cetex Petrochemicals, a major producer, had reportedly shut down due to unavailability of raw materi-

als. The plant has since begun production and prices are expected to stabilise in the coming weeks around earlier levels. Phthalic anhydride saw an increase of Rs. 10 per kg with poor arrival of imported material. Dye intermediates were stable with good availability of imported material. Other prices prevailed around the previous weeks levels.

We cannot guarantee the accuracy of the prices published in CHEMICAL WEEKLY as they are based only on the enquiries made by our correspondent -- and, as such they are not FIRM PRICES as between a buyer and seller. The prices are published only with a view to giving some ideas of the market conditions.

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Benic white powder	22+ST	Caustic soda (Lye)	11.50	Chromic acid	70.00
Acrylamide (Resale)	82.00	Calcium chloride 70% (Solid)	3.25	Ethylene urea	65.00
Barium carbonate	18.00	Calcium chloride 75-80%(fused)	3.50	Ferric chloride (Lumps)	9.00
Bleaching powder (33% Cl)	5.00	Calcium chloride 36% (Anhydrous)	5.00	Ferric chloride (Anhydrous)	20.00
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Mercury (34.5 Kgs)	10,800.00	Titanium Dioxide (Rutile - RCR ₂)	95+ST	Diethyl Phthalate	60.00
Nickel chloride	110.00	Tartaric acid	220.00	Diallyl Phthalate	44.00
Oxalic acid (Resale)	14.00	Trisodium phosphate	12.00	Dimethyl Phthalate	48.00
Peppermint oil (Rectified)	188+Ex+ST	Thiourea	75.00	Diethyl Adipate	58.00
Potassium carbonate (Indian)	28.00	Urea (Tech)	8.00	Dibutyl Adipate	42.00
Potassium carbonate (Imported)	32.00	Vacuum salt	1.00	Dipentene	15.00
Potassium bichromate	42.00	Zinc Dust	52.00	Dimethylamine 40%	30.00
Potassium phosphate (Mono)	34.00	Zinc Oxide	58.00	Dimethylamine 50%	36.00
Potassium phosphate (Di)	25.00	Zinc chloride powder (Tech.)	20.50	Ethyl Acetate	22.50
Polyvinyl alcohol (No. 117)	93.00	Zinc sulphate	7.00	Ethyl Acrylate	70.00
Polyvinyl alcohol (No. 173)	150.00	SOLVENTS		Ethylene Dichloride	18.00
Polyvinyl alcohol (No. 208)	170.00	Per Kg.		Ethylene Glycol	36.00
Paraformaldehyde (Resale)	22.50	Acetic Acid Glacial (Resale)	16.50	Formic Acid (Imp.)	24.00
Phthalic anhydride (Resale)	58.00	Acetic Anhydride (Resale)	37.00	Formaldehyde (Resale)	7.25
Pentaerythritol (Resale)	52.00	Acetone (Resale)	25.00	Glycerine (CP)	48.00
Paraffin wax	25+ST	Adipic Acid	90.00	Glycerine (IW)	55.00
Rangolite (German)	96+ST	Aceto Acetanilide	72.00	Hydrogen Peroxide 50% (Resale)	34.00
Rangolite (Czech.)	80.00	Aniline Oil (HOC)	44.00	Isopropyl Alcohol	38.00
Rangolite (China)	75.00	Benzoate Plasticiser	62.00	Isobutyl Alcohol (Resale)	35.00
Sodium sulphate (Fine)	3.75	Butyl Acrylate	85.00	Monoethanolamine (Resale)	105.00
Sodium sulphate (Coarse)	3.50	Butyl stearate	38.00	Melamine	60.00
Sodium sulphide 50-52% (Flakes)	11.50+ST	Butanol	34.00	Methyl Ethyl Ketone	90.00
				Methyl Isobutyl Ketone	42.00
				Methyl Acrylate	72.00
				Methylene Dichloride (Resale)	21.00

FOR YOUR REQUIREMENTS OF:

DI OCTYL PHTHALATE (D.O.P.) DIOCTYL MALEATE (D.O.M.)
 DI BUTYL PHTHALATE (D.B.P.) DI OCTYL ADIPATE (D.O.A.)
 DI BUTYL MALEATE (D.B.M.) BUTYL STEARATE

CONTACT MANUFACTURERS:

VIKRAM PLASTICIZERS

1204, Dalamal Tower, Plot No. 211, Nariman Point, Bombay-400 021

Tel. Nos: 231192, 231163, 233562, 230039, 233554

NEW DELHI

G-3, Harsha House, Karampura Commercial Complex, Opp. Milan Cinema, New Delhi 110 015.

Tel: 5455931, Res: 665588

HYDERABAD

Mittal Chambers, Office No. 5, 2-2-51, M.G. Road, Secunderabad 500 003

AHMEDABAD

7, Maharashtra Society, Mithakhali, Ellisbridge, Ahmedabad - 380 006

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- * ACTIVATED CARBON GRANULAR & POWDER
- * SILICA GEL WHITE & BLUE
- * SILICA GEL FABRIC BAGS
- * PRECIOUS METAL CATALYSTS & SALTS like Pd, Pt etc.

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(Authorised Signatory)

R.V. CORPORATION

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Phones: 325440/341184 Gram: AMARJYOT, Bombay 400 009



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Phone: 2711/2713

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K-208, Keshava Bldg., 2nd Floor, Bandra-Kurla Commercial Complex,
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Phone Nos.: 6407778/6424736 **Gram:** MULTIORG, Bombay-51
Telex: 011-74530 MOL IN

Factory: A-1, MIDC Industrial Area, Chandrapur-442 401 (M.S.).
Phone: 7-54 **Telex:** 716-213 MORG-IN

Carbitol	75.00 + ST
Meta Cresol	45.00
Nitrobenzene	22.00
Nitric Acid (Conc.) (RCF)	2.50
Octanol	52.00
Ortho Cresol	30+ST
Phenol (Resale)	44.00
Propylene Glycol	54.00
Polyethylene Glycol (No.200)	75.00
Polyethylene Glycol (No.400)	75.00
Polyethylene Glycol (No.500)	52.00
Polyethylene Glycol (No.1600)	54.00
Polyethylene Glycol (No.4000)	95.00
Polyethylene Glycol (No.6000)	85.00
Para Cresol	120.00
Styrene Monomer	50.00
Sorbitol	14.00
Sulphuric Acid	2.80
Trichloroethylene	26.00
Triethanolamine (Resale)	95.00
Turpentine Oil (Germany)	8.00
Turkey Red Oil (50%)	20.00
Vinyl Acetate Monomer	55.00

SOLVENTS Per Litre

Benzene	14.50
N-Heptane	10.50
N-Hexane	11.00
Methanol	9.25
Solvent Naphtha Heavy	10.50
Solvent Naphtha Light	8.50
Toluene	16.00
Xylene	31.00

DYES INTERMEDIATES (PRICES ARE WITHOUT TAX AND EXCISE)

Alphanaphthylamine	65.00
Alpha Naphthol (Imp.)	170.00
Aceto Acetic Ester (Methyl)	90.00
Ammonium Molybdate	250.00
Anthraquinone	155.00
Anthranilic Acid	100.00
2-Amino 4-Nitrophenol	140.00
Blue B. Base (Local)	330.00
Beta Naphthol (Atul)	60.00
Benzidine Dihydrochloride (BDH)	90.00
Bromamine Acid	540.00
BON Acid (Incl. of excise)	150.00
Chicago Acid (Atul)	340.00
Coach Acid	58.00
C. Acid (Imp.)	195.00
Cyanuric Chloride	156.00
2,4- DNCB	33.00
Dihydrothio PTOS (Imp.)	1,600.00
Dimethyl Aniline	64.00
Diethyl Aniline	125.00
Diamino stilbene	
disulphonic acid	165.00
3,3-DCB	215.00
Gamma Acid (Atul)	165.00
Gamma Acid (Local)	140.00
H. Acid (Atul)	135.00
G. Salt	60.00
J. Acid	330.00
J. Acid Urea	460.00
K. Acid	105.00
MPDS (German)	190.00
MNA	120.00

Meta Ureido Aniline	175.00
MPD (Local)	185.00
MPD (German)	190.00
Naphthenic Acid	46.00
N-Methyl J. Acid	510.00
N-Methyl Aniline	125.00
Naphthalene (Refined)	24.00
Ortho Anisidine (OA) (Imp.)	120.00
Ortho Dichloro Benzene (ODCB)	18.00
OT Base	145.00
Para Dichloro Benzene (PDCB)	29.00
Para Anisidine (PA local)	145.00
PNA	110.00
Para Cresidine (Imp.)	325.00
Para Amino Azo Benzene (India)	135.00
PNCB (HOC)	56.00
Para Amino Acetanilide	195.00
1-Phenyl 3-Methyl	
5-Pyrazolone	142.00
Phenyl J. Acid	360.00
Para Amino Benzoic Acid	125.00
PT Base	133.00
Rhoduline Acid	550.00
Resist Salt 80%	30.00
Resorcinol	285.00
Sodium Naphthionate	67.00
5-Sulpho-Anthranilic Acid	100.00
Sulphanilic Acid	35.00
Sulpho Tobias Acid	140.00
Trichloro Benzene (TCB)	28.00
Tobias Acid (Imp.)	130.00
Metanilic Acid	42.00
MTD (German)	130.00

We Manufacture Chemicals For Industrial Use

- Acetic Acid
- Acetic Anhydride
- Acetaldehyde
- Industrial Alcohol
- Monochloro Acetic Acid
- Ethyl Acetate
- Butyl Acetate
- E D T A
- N T A
- Carboxy Methyl Cellulose



ASHOK ORGANIC INDUSTRIES LTD.

406, Sharda Chambers, 33, Sir Vithaldas Thackersey Marg (New Marine Lines), Bombay-400 20

Phone : 252236 : 252256 : 317511 Gram : 'ASHOKBROS' Telex : 11-3853 AOIL IN

Also Please Contact:

Baroda : Phones : 324519-325769
Telex : 0175-597 AOIL IN
Ahmedabad : Phone : 78009
Ankleshwar : Phone : 2461-2462
Telex : 0189-238 AOIL IN

New Delhi : Phones : 5710733-5711057
Calcutta : Phones : 282474-282475
Telex : 021-7917 SBIL IN
Madras : Phone : 582046
Telex : 041-7527 SBIL IN

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AGRICULTURE DUSTING POWDER

SULPHUR DUST 85% DP

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Telex: 011-76463 DVS IN

Gram: SULFREFINE

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***4-NITRO, 2-AMINO PHENOL**

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Phone : 812002 / 813591

(KNS-ADI)

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DIACETONE
N-BUTANOL
ISOBUTANOL
D.E.G. / E.D.C.
BENZENE / M.E.G.
M.E.K. / M.I.B.K.
TOLUENE
SODIUM FORMATE
IPA-CBM

XYLENE
(ORTHO/PARA/MIX)
SOLVENTS C-IX (CRUDE)
NITROBENZENE
FORMALDEHYDE (37% HOC)
PHENOL (LIQUID/CRYSTAL)
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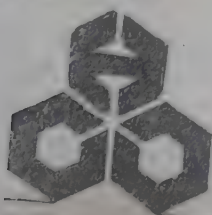
Please Contact:

Hiren Chem Corporation

306, Adamji Building, 3rd Floor, 413-Narshi Natha Street, Bombay 400 009.

Tel: 343426-333692-338139. (R) 5604922.

Branch Office: SHINE PHARMA CHEM



Bombay Drugs Market

(Prices as on December 4, 1990)

Product	Rs./kg.	Product	Rs./kg.	Product	Rs./kg.
Acriflavine DPC	850.00	Disodium Hydrogen Citrate	43.00	Niacin	220 00
Aluminium Hydroxide IP	45.00	Ephedrine HCL	1850 00	Niacinamide	250 00
Ampicillin Trihydrate	1800.00	Erythromycin Estolate	2350.00	Nifedipine	1100 00
Aminophylline	360.00	Erythromycin Stearate	2150.00	Nitrofurazole	280 00
Albendazole	2100.00	Ethambutol IP	875 00	Oxyphenbutazone	775 00
Analgin	280.00	Ethophylline	650.00	Papaverine HCl	2000 00
Aspirin IP	90.00	Ferrous Fumarate	41.00	Paracetamol	180.00
Atenolol	2900.00	Folic Acid IP	2800.00	Pectin IP	425 00
Benzoic Acid IP	34.00	Furosemide IP	2200.00	Pepsin 1:3000	375 00
Bromine	67.00	Furazolidone IP	385.00	Phenbarbitone	510.00
Bromhexine HCL	2400	Guanidine Nitrate	40.00	Pheniramine Maleate	1250 00
Butylated Hydroxy Toluene	650.00	Gallic Acid	320.00	Phenyl Butazone USP	550 00
Caffeine Citrate IP	390.00	Haloperidone	19,000.00	Piperazine Citrate	100 00
Caffeine IP	410.00	Hematropine Methyl Bromide	12.00	Piperazine Hexahydrate	95 00
Calcium Gluconate IP	45.00	Hydrazine Hydrate	92.00	Potato Starch	65.00
Calcium Glycerophosphate	160.00	Ibuprofen IP	365.00	Propanolol HCL	1100 00
Calcium Lactate	40.00	Indomethazine	850.00	Pseudoephedrine HCL	2200 00
Calcium Phenethonate	700.00	I.N.H.	270 00	Pyrazinamide	1200 00
Cetrimide IP	210.00	Inosite IP	900.00	Ranitidine	2800.00
Chloramphenicol Powder	1900.00	Iodochloro Hydroxyquinoline	525.00	Rifampicin IP	3900 00
Chlorbutol	95.00	Lactose IP	40.00	Saccharine Sodium	215 00
Chlorhexidine Gluconate 20% BP	225.00	Lactic Acid	90.00	Salbutamol Sulphate	7300 00
Chloroquin Phosphate	850.00	Levamisole	1525.00	Sodium Iodide	425 00
Chlorpromazine HCL	1500.00	Lignocaine HCl	350.00	Sodium Methoxide	105 00
Choline Chloride FG	35.00	Lignocaine Base	350.00	Sorbitol Powder	115 00
Choline Chloride IP	58.00	L. Lysine Feed	95.00	Sorbitol USP	15.00
Cloxacillin Sodium	2300.00	L. Lysine Pharma	300.00	Sulphacetamide	300 00
Cimetidine	2100.00	Magnesium Hydroxide	30.00	Sulphamethoxazole	335 00
Citric Acid IP	45.00	Magnesium Trisilicate IP	12.00	Tinidazole	375 00
C.P. Maleate	1050.00	Mannitol USP	105.00	Theophylline Anhydrous	370 00
Cyproheptadine Td	9500 00	Mebendazole	610.00	Thiacetazone	290 00
Diazepam	800.00	Mercurochrome NF	280.00	Tolbutamide	200 00
Dicyclomine Hcl	1500.00	Methyl Chloroformate	85.00	Trimethoprim IP	1050 00
Diethyl Carbamazine Citrate	300.00	Metochlopromide TCL	2200.00	Vitamin A Palmitate	3100 00
Di-iodohydroxyquinoline	525.00	Metronidazole IP	450.00	Vitamin B6 Hydrochloride	1450 00
Diloxanide Fumarate IP	580.00	Morpholine	115.00	Vitamin B2 5-Phosphate	4100 00
Diphenhydramine HCL	260.00				

FOR YOUR REQUIREMENTS OF
SULFAMIC ACID DESCALANT
SODIUM SILICO FLUORIDE (Bharat Fertilizer)
CITRIC ACID (Citurgia Bio-Chemicals)
SODIUM SILICATE
SODIUM SULPHIDE IRON FREE (Italian Make)
BARIUM CARBONATE
BARIUM CHLORIDE

Please Contact:

UNION CHEMICAL AGENCY

231, Samuel Street, Vadgadi, Bombay 400 003

Tel.: 321462/343117

*

Grams: 'LAXNAGAR', Bombay

Bombay Dyes Market

(Prices as on December 4, 1990)

ACID COLOURS		Per Kg.			
Acid Violet 4BS	*190.00	Brill. Fast Helio 2R	385.83	Red 2B	422.40
Acid Maroon V	110.00	Brill. Fast Helio 2RS	177.30	Red FB	425.80
Acid Orange II	112.55	Brill. Fast Helio BS	116.10	Red Violet FBL	622.00
Acid Orange IIY	93.85	Brill. Violet Extra	181.45	Orange 3R	254.20
Acid Red A	137.00	Blue 2B	102.50	Violet 3R	370.50
Acid Scarlet 3R	128.35	Blue G	220.45	Violet RL	355.70
Acid Red 38N	*195.00	Sky Blue FB	242.00	Violet 6R	638.20
Acid Red R2R	132.00	Copper Blue GR	190.25	Scarlet RR	283.50
Acid Red RS	88.00	Fast Greenish Blue GL	114.60	Rubine 3B	289.10
Acid Patent Blue AS	*280.00	Developed Black BT	149.95	Rubine CB	449.50
Acid Green V	*375.00	Blue NB-2B	348.45	Blue GL	419.00
Acid Coomasi Blue	200.00	Blue NB-2BG	214.70	Blue BGF	805.80
Acid Yellow 5GN	65.00	Developed Black NB-GHB	214.70	Navy Blue RE	359.90
Acid Red PG	85.00	Green B	142.75	Brown 3REL	272.80
Acid Red GRS	78.00	Green NB-B	218.90	Black GEL	420.10
Acid Black 10 BX	157.15	Green 2B-N	218.90	Dark Brown 3B	411.10
Acid Black BX	126.95	Brown MR	197.40		
Acid Black Wax	135.50	Brown CN	137.00		
Crosein Scarlet MOO	200.30	Golden Brown G	175.85		
Procinil Yellow GS (ICI, UK)	265.00	Catechin G	155.70		
Procinil Red GS (ICI, UK)	530.00	Omega Tan	161.45		
Procinil Blue RS (ICI, UK)	315.00	Catechin GS	102.80		
Procinil Scarlet G (ICI, UK)	600.00	Black E Hly Conc.	180.15		
Procinil Orange G (ICI, UK)	250.00	Black E Extra Hly. Conc.	180.15		
Procinil Rubine (ICI, UK)	550.00	Black NB-ER Hly. Conc.	290.50		
To get resale price add 6% tax.					
DIRECT COLOURS		Per Kg.			
Yellow 3GX	114.00				
Gun Yellow RCH	175.85				
Fast Yellow GCH	171.50				
Yellow CFG Hly. Conc.	721.00				
Fast Yellow GS	126.96				
Fast Yellow CHRS	116.85				
Viscose Orange A	210.35				
Fast Orange GR	171.50				
Red	122.65				
Dark Tan	98.15				
Red IIR	98.15				
Red 4B	217.55				
Bordeaux BW	170.10				
Fast Scarlet 4BS	223.50				
Red 12B	220.45				
Bordeaux Hly. Conc.	249.20				
Cotton Red N	117.05				
Brill. Fast Helio B	362.85				
		Per Kg.			
		Red B 3B Conc.	611.50		
		Red B 2B Conc.	797.90		
		Red CB Powder	1048.25		
		Red D2B Powder	580.65		
		Violet C 4R	1202.70		
		Blue BG Powder	580.65		
		Blue BN Powder	128.25		
		Blue D 2R Powder	588.25		
		Navy BT Conc.	531.95		
		Blue B 2G Conc.	577.95		
		Blue BT Conc.	319.50		
		Blue BR	482.40		
		Yellow 7GL	813.20		
		Yellow 5RX	269.90		
		Yellow 3G	473.20		
		Yellow	140.00		
		Yellow AL	167.20		
		Yellow Brown REL	311.70		
		Yellow FFL	571.40		
		Gold Yellow GG	320.80		
		Pink REL	593.00		
		Red BEL	615.60		
		Per Kg.			
		Fast Yellow GC	77.75		
		Fast Orange GC	128.40		
		Fast Scarlet R	198.05		
		Fast Scarlet RC	128.40		
		Fast Scarlet RCR	105.60		
		Fast Scarlet G	115.75		
		Fast Scarlet GN	92.95		
		Fast Scarlet GG	77.75		
		Fast Scarlet GGS	73.95		
		Fast Red B	233.50		
		Fast Red RC	115.75		
		Fast Red R Flakes	158.80		
		Fast Red TR	181.60		
		Fast Red TR Oil	223.35		
		Fast Red RL	251.20		
		Fast Red KB Oil	251.20		
		Fast Bordeaux GP	236.00		
		Fast Garnet GBC	103.05		
		Fast Violet B	548.80		
		Fast Blue BB	566.50		
		Per Kg.			
		ASG	301.85		
		AS	205.65		
		ASSW	379.10		
		ASBS	253.75		
		ASBO	266.40		
		ASD	209.45		
		ASOL	243.60		

ASTR	369.00	Blue H-FRD	305.80	Brill. Purple 2R Hly. Conc.	744.25
ASPH	336.05	Navy Blue H ER	333.75	Brill. Purple 4R Supra Disp.	604.25
ASE	236.00	Blue H 5RX	286.20	Brill. Purple 2R Acra Conc.	779.85
ASEL	249.95	Navy Blue M 3R	355.70	Blue 2R Pdr. Fine	675.30
ASLB	2,002.35	Brill. Blue MR	405.60	Blue BC Acra Conc. Pdr. Fine	1013.15
ASBT	2,459.45	Brill. Blue M RX	214.20	Blue BC Conc. Pdr. Fine	713.65
ASWG	143.00	Brill. Blue M-G	226.45	Blue R Conc. Pdr. Fine	719.70
ASSG	538.65	Blue M 4GD	369.40	Blue Conc. Powder	645.80
ASSR	652.60	Navy Blue M RB	341.85	Brill. Blue 2R Hly. Conc.	378.55
		Turquoise M-G	240.30	Blue RR Supra Powder	629.35
		Brill. Blue M GX	516.25	Brill. Blue 2R Supra Disp.	115.65
PROCION COLOURS	Per Kg.	Blue 3R Acra Powder	718.20	Dark Blue 2R Powder Fine	512.65
		Dark Brown H 6R	248.45	Blue BC Supra Disp.	419.65
Golden Yellow HR	207.95	Cobalt Oxide	285.00	Jade Green XBN Powder Fine	555.80
Brill. Yellow H4G	145.65	Green H 4BD	287.00	Jade Green XBN Acra	
Supra Yellow H-8GP	168.55	Green H-E4BI	169.80	Conc. Pdr.	1026.05
Brill. Yellow HE6G	214.75	Red Brown H IF	143.25	Jade Green 2G Pdr. Fine	533.25
Yellow G-E4R	276.05	Orange Brown H 28	209.05	Jade Green 2G Ptg. Paste	125.40
Brill. Yellow H7G	332.30	Brown M GRN	188.80	Jade Green XBN Ptg. Paste	126.00
Yellow M4R	275.45	Black H-N	314.20	Jade Green 2G Supra Disp.	618.00
Yellow M GR	387.65			Olive D Pdr. Fine	533.90
Brill. Yellow M4G	201.15			Olive Green B Supra Disp.	421.70
Brill. Yellow M8G	366.10	SULPHUR COLOURS	Per Kg.	Jade Green XBN Supra Disp. (N)	327.30
Yellow M 3R	244.70			Olive OMW Pdr. Fine	698.55
Brill. Orange H 2R	303.80	Navy Blue	210.35	Olive OMW Supra Disp.	538.05
Brill. Red H 7B	157.95	Green G	194.55	Olive D Supra Disp.	361.70
Brill. Orange M 2R	313.15	Black Grains Extra	72.25	Olive R Supra Disp.	470.25
Brill. Red H 8B	213.55	Black Grains OG	73.70	Olive D Ptg. Paste	193.00
Brill. Scarlet H RN	245.05	Black GXE Conc.	70.85	Olive Green B Ptg. Paste	199.10
Supra Red H-3BP	179.80	Black GXE	57.90	Olive Green B Acra Conc.	741.10
Brill. Red H-F3B	243.45	Black GXR	69.40	Olive R Acra Conc.	779.85
Brill. Magenta HB	182.00	Black Grains 800	62.80	Brown R Pdr. Fine	869.45
Brill. Red M 5B	160.05	Black EXR Grains	73.70	Dark Brown 3R Fine	826.25
Brill. Red M 8B	218.35	Black EXR Grains 800	59.35	Brown G Supra Disp.	582.05
Brill. Pink MB	137.10			Brown 2G Supra Disp.	716.10
Brill. Magenta MB	163.65			Brown R Supra Disp.	547.35
Brill. Purple H-3R	219.55	VAT COLOURS (ICI)	Per Kg.	Brown BR Powder	867.75
Brill. Purple H-7R	175.40			Dark Brown 3R Ptg. Paste	217.15
Navy Blue H 3R	333.75	Yellow 5G Supra Disperse	561.85	Dark Brown 3R Supra Disp.	529.60
Brill. Blue H-GR	406.40	Yellow 5G Acra Con.	818.60	Brown G Acra Conc.	967.95
Brill. Blue H 5G	207.95	Gold Orange 3G Pdr. Fine	1158.45	Brown M. Powder Fine	768.80
Blue H 5RX	286.20	Brill. Orange 6R Pdr. Fine	624.35	Grey M. Supra Disp.	585.45
Brill. Blue H 7G	213.95	Gold Orange 3G Supra Disp.	693.85	Blue BC Acra Conc. Pdr. Fine	762.70
Brill. Blue H 7RX	358.15	Brill. Orange 6RX Powder	394.30	Direct Black AC Supra Disp.	415.75
Turquoise HA	265.05	Brill. Red 3B Pdr. Fine	1214.15	Direct Black AC Pdr. Fine	574.70
Supra Blue H-3RP	595.30	Brill. Red 3B Supra Disp.	867.45	Direct Black CH Supra Disp.	490.45
Supra Turquoise H 2G P	181.50	Brill. Purple 3R Acra Powder	827.05	Direct ACD Ptg. Paste	217.15

Delhi Market

DELHI: NOVEMBER 30: NNS Chatkolite suffered a setback of Rs. 6 at Rs. 66 per kg in the Delhi chemicals market during last week, following increased supply and lower advices from Bombay. In Bombay its prices slipped from Rs. 70 to Rs. 64. On withdrawal of demand from gur and khandsari manufacturers of U.P., sufolite suffered a setback of Rs. 7 at Rs. 71 per kg. Rangolite Germany was being offered lower at Rs. 100 against Rs. 105, in the absence of buying support. Sodium hydrosulphite kalali moved down from Rs. 52 to Rs. 51. Boric acid technical jumped down by Rs. 150 at Rs. 2,100 per 50 kg due to better supply. Borax and sodium nitrite fell sharply by Rs. 25/50 at Rs. 975 and Rs. 900/1,050. In the absence of demand from consumers, sodium sulphate DCM red marka dropped from Rs. 4,600 to Rs. 4,500 per tonne, whereas sodium sulphate Gwalior Rayon edged up by Rs. 50 at Rs. 4,150 due to paucity of supply. Titanium dioxide RC-822 declined from Rs. 85 to Rs. 84 per kg.

In the absence of supply from Bombay, coupled with rise in demand from consumers, citric acid

Chinese jumped up by Rs. 50 at Rs. 2,300 per 50 kg. As a result of shortage of stock, mercury spurted by Rs. 200 at Rs. 11,000 per flask. Similarly ammonia bicarb rose from Rs. 190 to Rs. 195 per 25 kg owing to improved demand from bakeries. Caustic soda flakes jumped up by Rs. 15 at Rs. 580 per 50 kg in the wake of increased demand from stockists. Phosphoric acid shot up by Rs. 75 at Rs. 1,475 in view of dwindling supply. Potassium nitrate advanced sharply by Rs. 50/100 at Rs. 1,100/1,300 per quintal.

In the absence of fresh supply and tight stock, residue wax registered a marked rise of Rs. 500 at Rs. 6,000 per tonne. Likewise slack and match wax remained firm at Rs. 13,000 and Rs. 21,000 per tonne. On account of supply from U.P. and sustained demand from Bombay and Indore, menthol flake, medium and bold moved up by Rs. 5/10 at Rs. 285, Rs. 300 and Rs. 315. DMO and mentha oil quoted higher by Rs. 5/8 at Rs. 80 and Rs. 200 per kg respectively. Trading activities remained restricted in dyes and colours during the week and prices hovered around at their previous closing.

(DELHI MARKET RATES AS ON NOVEMBER 30, 1990)

Ammonia Bicarb (Per 25 Kg.)	195.00	Tartaric acid France (Per Kg.)	314.00
Mercury (Per flask)	11,000.00	Sufolite (Per Kg.)	71.00
Soda ash (Per bag)	375/385.00	Chatkolite (Per Kg.)	66.00
Ammonium Chloride (50 Kg.)	140/180.00	DMO (per Kg.)	80.00
Caustic soda flakes (50 Kg.)	580.00	Boric acid Technical (Per 50 Kg.)	2,100.00
Citric acid (Per 50 Kg.)	2,300/2,450.00	Paraffin Wax (Per 50 Kg.)	1,200.00
Stable Bleaching Powder		Slack wax (Per metric tonne)	13,000.00
Shriram (Per 25 Kg.)	101.00	Tartaric Acid (France Per Kg.)	314.00
Stable Bleaching Powder KCl		Tartaric Acid (Swastik Per Kg.)	210.00
(Per 25 Kg.)	90.00	Borax Granular (Per 50 Kg.)	975.00
Stable Bleaching Powder		Borax Crystal (Per 50 Kg.)	975.00
Maruti (Per 25 Kg.)	91.00	Sodium Nitrite (Per 50 Kg.)	900/1,050.00
Stable Bleaching Powder		Sodium Nitrate (Per 50 Kg.)	520.00
Modi (Per 25 Kg.)	92.00	Camphor Thal (Per Kg.)	115.00
Sodium Bicarbonate (50 Kg.)	325/350.00	Camphor Powder (Per Kg.)	102.00
Sodium Hydrosulphite (Per Kg.)	46/51.00	Menthol Bold (Per Kg.)	315.00
Rangolite (Per Kg.)	100.00	Menthol Medium (Per Kg.)	285.00

Menthol Flake (Per Kg.)	285.00
Mentha Oil (Per Kg.)	200.00
Glycerine (Per Kg.)	53/56.00
Sodium Silicate (Per quintal)	300/400.00
Hexamine (Per Kg.)	34.00
Acetic Acid Glacial (Per Kg.)	17.00
Copper Sulphate	
(Per quintal)	2,400/2,600
Formic Acid (Per Kg.)	25.00
Formaldehyde (Per Kg.)	8.50
Hydrogen Peroxide (Per Kg.)	32.50/34.50
Calcium Carbonate	
(Per Tonne)	2,800/5,800
Acid Slurry Soft (Per Kg.)	42.00
Acid Slurry Hard (Per Kg.)	35.00
Phosphoric Acid (Per 50 Kg.)	1,475.00
Potassium Nitrate	
(Per quintal)	1,000/1,300.00
Potassium Permanganate	
(Per 50 Kg.)	2,600/3,000.00
Sodium Bichromate	
(Per 50 Kg.)	1,600.00
Trisodium Phosphate (50 Kg.)	700.00
Titanium Dioxide Anatase T.T.P.	
(Per Kg.)	63.00
Titanium Dioxide RC-822 (Per Kg.)	84.00
Titanium Dioxide Anatase K-Brand	
(Per Kg.)	59.00
Titanium Dioxide RCR-2 (Per Kg.)	90.00
Zinc Oxide (Per Kg.)	46.00/50.00
Phenol Carbolic Acid (Per Kg.)	41.00
Carbon Tetrachloride (Per Kg.)	24.75
Chloroform (Per Kg.)	28.00
Sodium Sulphate	
(Per metric tonne)	4,150/4,500.00
Naphthalene Balls (Per 50 Kg.)	1,500.00
Match Wax	21,000.00
Residue Wax	6,000.00

DYES & COLOURS (Per Kg.)

Naphthol AS	175/211.50
Naphthol ASG	180/249.70
Naphthol ASBS	210/260.75
Naphthol ASTR	300/378.92
Naphthol ASOL	210/250.90
Naphthol ASGO	195/274.30

DIRECT DYES (Per Kg.)

Black E. Conc.	120/185.30
Diazo Black B.T.	105/154.50
Green B	90/147.55
Blue 2-B	60/107.00
Blue 2-B 225% (JNR)	125.00
Sky Blue FB	160/248.20
Basic Auramine	55/110.00
Basic Rhodamine	315/425.00
Basic Methylene Blue	100/180.00
Basic Violet	165/210.00
Basic Malachite Green	185.00
Acid Orange	75/111.20
Congo Red H/C	85/120.95

Madras Market

Though prices quoted are marginally high, market lacked buoyancy. Arrival of goods from the northern centres were poor due to shortage of fuel.

Similarly goods were not going out also. MEK prices shot up due to poor

availability. Phthalic anhydride prices came down on better availability. Though there is no change in price of caustic soda flakes, market information is that prices of these products might go up in the next week.

(MADRAS MARKET RATES AS ON DECEMBER 1, 1990)

Acetic Acid Glacial (per kg)	16.00	Hydrosulphite of Soda (BASF) (per kg)	48.00
Aluminium Sulphate Iron free (per MT)	4,500.00	Hexamine (per kg)	35.00
Ammonium Bicarbonate (per 25 kgs)	175.00	Hyflosupercell (per kg)	30.00
Ammonium Chloride (per MT)	3,000.00	Hydrogen Peroxide (per kg)	38.00
Acid Slurry (per kg)	35.00	Litharge (per kg)	40.00
Barium Carbonate (per kg)	10.50	Lead Acetate (per kg)	40.00
Barium Chloride (per kg)	9.50	Magnesium Carbonate (per kg)	16.00
Boric Acid Technical (per kg)	28.00	Magnesium Chloride (per kg)	4.00
Bleaching Powder (per 50 kgs)	220.00	Maleic Anhydride (per kg)	45.00
Borax (per 50 kgs)	815.00	Menthol Crystals (per kg)	400.00
Caustic Soda Flakes -- Metturr Chemicals (per MT)	11,500.00	Oxalic Acid (per kg)	17.00
Caustic Soda Flakes -- Andhra Sugars (per MT)	11,500.00	Paraffin Wax (per kg)	25.00
Calcium Chloride 70% Solid (per MT)	3,500.00	Potassium Bichromate (per kg)	40.00
Calcium Chloride Anhydrous (per MT)	6,000.00	Phosphoric Acid (per kg)	32.00
Calcium Carbonate (Activated) (per MT)	6,600.00	Polyvinyl Alcohol Powder (per kg)	150.00
Calcium Carbonate (Precipitated) (per MT)	5,800.00	Pentaerythritol (per kg)	55.00
Citric Acid (per kg)	48.00	Phthalic Anhydride (per kg)	50.00
Copper Sulphate (per kg)	25.00	Soda Ash (TAC) (per 75 kgs)	385.00
Cresylic Acid 98-99% (per kg)	140.00	Soda Ash (TATA) (per 75 kgs)	410.00
Pure Para Cresol 96% (per kg)	105.00	Sodium Bicarbonate (TATA) (per 50 kgs)	395.00
Meta Para Cresol 42% (per kg)	55.00	Sodium Silicate (per MT)	4,000.00
Formic Acid (per kg)	26.00	Sodium Bichromate (per kg)	34.00
Formaldehyde (per kg)	8.00	Sodium Nitrate (per kg)	8.00
Glue Flakes (per kg)	15.00	Sodium Nitrite (per kg)	20.00
Glycerine I.W. (per kg)	49.00	Sodium Sulphide Flakes (per kg)	20.00
Hydrosulphite of Soda (TCPL) (per kg)	42.00	Sodium Bisulphite (per kg)	8.00
Hydrosulphite of Soda (IDI) (per kg)	45.00	Sodium Alginate (per kg)	400.00
		Sodium Acetate (per kg)	8.00
		Sodium Sulphate (Anhydrous) (per kg)	4.25
		Titanium Dioxide (Anatase) (per kg)	65.00
		Titanium Dioxide (Rutile) (per kg)	85.00
		Trisodium Phosphate (per kg)	10.00
		Urea (Technical) (per kg)	3.00
		Zinc Oxide (per kg)	52.00

CALCUTTA MARKET

(Prices as on Nov. 30, 1990)

Acetic acid (per 50 kg)	725.00
Basic chrome sulphate (per 50 kg)	850.00
Benzene (litre)	14.00
Bleaching powder (bag)	230.00
Borax granular (per 50 kg)	NA
Boric acid (per 50 kg)	1,200.00
Camphor (per kg)	107.00
Caustic soda solid	NA
Caustic soda flakes (per 50 kg)	575.00
Glycerine (per kg)	52.50
Menthol bold (per kg)	350.00
Menthol medium (per kg)	325.00
Menthol small (per kg)	275.00
Phosphoric acid (per 50 kg)	1,400.00
Phenol (per kg)	42.00
Soda ash (75 kg)	395.00
Sodium bichromate (per 50 kg)	3,250.00
Sodium bicarbonate (per 50 kg)	375.00
Sodium nitrate (per 50 kg)	450.00
Sodium sulphate anhydrous (per 50 kg)	NA
Sulphuric acid (per ton)	2,200.00
Trisodium phosphate (per 50 kg)	375.00
Toluene (litre)	18.00

Zinc Chloride Powder (per kg)	14.00
Zinc Sulphate (per kg)	9.00

SOLVENTS

Acetone -- HOCL (per kg)	25.00
Butanol (per kg)	39.00
Butyl Acetate (per kg)	39.00
Benzene (per lit)	17.00
Cellosolve (per kg)	70.00
Carbon Tetra Chloride (per kg)	23.00
Chloroform (per kg)	28.00
Diacetone Alcohol (per kg)	34.00
Diethylene Glycol (per kg)	42.00
Dichloroethane (per kg)	20.00
Di-octyl Phthalate (per kg)	65.00
Di-N-butyl Phthalate (per kg)	65.00
Ethyl Acetate (per kg)	25.00
Isopropyl Alcohol (per kg)	34.00
Methanol (per kg)	12.00
Methylene Chloride (per kg)	22.00
Methyl Ethyl Ketone (per kg)	80.00
Methyl Isobutyl Ketone (per kg)	47.00
Phenol (per kg)	48.00
Sorbitol (per kg)	15.00
Triethanolamine (per kg)	95.00
Trichloroethylene (per kg)	27.00
1-1-1 Trichloroethane (per kg)	29.50
Turpentine (per lit)	16.00
Toluene (per lit)	18.00
Xylene (per lit)	32.00

Shipping News

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

Due Date (1)	Steamer's Name & Flag (2)	Agents (3)	Will load for (4)	Approx. sailing date (5)
6/12	Ever Bridge (V-043)	Greenways	New York; Baltimore; Charleston; New Orleans; Houston; Boston; Providence (RI); Philadelphia; Norfolk; Savannah; Jacksonville; Wilmington; Miami; Montreal; Toronto; Bermuda; Los Angeles; Longbeach; San Francisco; Oakland; San Diego; Stockton; Richmond; Almeida; Red Wood City; Sacramento; Seattle; Portland; Vancouver (B.C.); Tacoma; Longview; Chicago; Dallas; Various inland destinations & Caribbean Ports. (Carting at G/H Cotton Depot).	13/12
11/12	Kapitan Kud	Marathon	Boston; New York; Baltimore; Norfolk. (Carting at T.P. No. 3).	14/12
11/12	Ocean Sincerity (V-29A/B)	O.S.A.	New York; Baltimore; Philadelphia; Houston; Boston; Chicago; Dallas; Atlanta; Savannah; Norfolk; Charleston; Los Angeles; San Francisco; Oakland; Seattle; Vancouver; Toronto; Montreal; Portland; Tacoma; & S. American & W. Indies Ports. (Carting at B. Pier Extn.).	19/12
11/12	Rhine Forest (V-118) (Lib)	M.S.P.L.	Philadelphia; Baltimore; Norfolk; New Orleans; Houston; Savannah; New York. (Carting at P/Q-PD).	12/12
9/12	Vishva Parimal (Ind)	S.C.I.	New York; Baltimore; Savannah; Norfolk; Charleston; Houston; Jacksonville; New Orleans; Boston; P. Everglades. (Carting at B. Pier Extn. & Kalamboli Shed No. 4).	12/12
6/12	Ever Bridge (V-043) (Pan)	Greenways	Hamburg; Felixstowe; Rotterdam; Antwerp; Le Havre; London; Liverpool; Leixoes; Lisbon; Manchester; Avonmouth; Wembly; Birmingham; Leeds; Leicester; Amsterdam; Bremen; Copenhagen; Aarhus; Gothenburg; Oslo; Stockholm; Helsinki; Belfast & All Destinations in U.K.; Germany; Switzerland & Austria. (Carting at G/H Cotton Depot).	13/12
9/12	Vishva Parimal (Ind)	S.C.I.	P. Said; Felixstowe; Hamburg; Rotterdam; Antwerp; Bremen; Liverpool; Manchester; Avonmouth; London; Belfast; Aarhus; Oslo; Helsinki; Copenhagen; Gothenburg & All Inland Destinations. (Carting at B. Pier Extn. & Kalamboli Shed No. 4).	12/12
11/12	Kapitan Kud (Rus)	Transocean/ I.S.S. Co.	Tilbury; Avonmouth; Liverpool; Manchester; London; Felixstowe; Birmingham; Antwerp; (Rotterdam); Hamburg; Bremen; Copenhagen; Gothenburg; Oslo; Stockholm; Malmao; Leeds. (Crtg. at T.P. No. 3).	14/12
11/12	K. Shev. kovskiy	Transocean	Felixstowe; Tilbury; Antwerp; Rotterdam; Hamburg; Bremerhaven & Scandinavian Ports. Via Hamburg. (Carting at E-Grain Depot).	13/12
11/12	Rhine Forest	M.S.P.L.	Odessa; Iliychevsk; Havana; (Cuba); Genoa; Trieste; Piraeus; Marseilles; Barcelona; Varna; Bourgas. (Carting at Kalamboli).	12/12
6/12	Ever Bridge	Greenways	Assab. (Carting at P/Q-PD).	13/12
11/12	K. Shev. kovskiy	Transocean	Colombo. (Carting at G/H Cotton Depot).	13/12
6/12	Ever Bridge (V-043) (Pan)	Greenways	Afghanistan. (Carting at Kalamboli).	13/12
11/12	Ocean Sincerity (V-29A/B) (lib)	O.S.A./ M.S.P.L.	Singapore; Penang; Port Kelang; Bangkok; Djakarta; Surabaya; Manila; Cebu; Kaohsiung; Keelung; Osaka; Yokohama; Kobe; Shimizu; Moji; Nagoya; Busan; Hongkong. (Carting at G/H Cotton Depot).	19/12
11/12	Rhine Forest	M.S.P.L.	P. Kelang; Singapore; Kaohsiung; Hongkong; Bangkok; Kobe; Yokohama; Nagoya; Moji; Osaka; Busan; Tokyo; Shimizu; Keelung; Tsingtao; Qhindao; Xiangang; Shanghai. (Carting at B. Pier Extn.).	12/12
11/12	Ocean Sincerity	O.S.A.	Singapore; Bangkok; P. Kelang; Penang; Jakarta; Ho Chi Minh; Kaohsiung; Busan. (Carting at E-Shed Grain Depot).	19/12
12/12	Kap. Medvetskiy	Sai Ship	Singapore; P. Kelang. (Carting at P/Q-PD).	16/12
			Sydney; Melbourne; Adelaide; Brisbane; Fremantle; Auckland; Wellington; Lyttleton; P. Chalmers. (Carting at B. Pier Extn.).	
			Mombasa; Dar Es Salaam. (Carting at E-Shed Grain Depot).	

VESSELS DUE FOR IMPORT DISCHARGE

Due Date	Steamer's Name	Agents	From
12/12	Asean Honour	Swanship	Malaysia
14/12	Contship Asia	Samrat/Hindustan/L. Triest	U.K. Cont. & Med.
12/12	Seacrest Achiever (V-223)	Seaspeed/Merzario/Penguin	U.K. Cont./U.S.A. & Gulf
15/12	Trans Globe	Swan Ship	Far East
22/12	Vishva Parijat	S.C.I.	U.K. Cont/U.S.A.
13/12	Vishva Navak	S.C.I.	Iliychevsk & Bandirma

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Materials Imported/Exported

Imports values are c.i.f port. Export values are f.o.b. port

MATERIALS IMPORTED MADRAS

(From 1.8.90 To 8.8.90)

(continued from previous issue)

ALPHA PHENYL GLYCINE CHLORIDE: From Netherlands: SOL Pharmaceuticals Ltd., 2,150 Kgs., Rs. 8,00,648.

PHOSPHORIC ACID: From USA: MFL., 5,995.909 Mts., Rs. 4,04,13,264; From USA: Madras Fertilisers Ltd., 5,299.245 Mts., Rs. 3,58,61,479.

POTASSIUM CHLORIDE: From Canada: Std. Alkalies, 3,000 Mts., Rs. 78,50,211; Standards Industries Ltd., 2,550 Mts., Rs. 66,77,880.

PROPYLENE GLYCOL: From Japan: Jaynil Pharmaceuticals Pvt. Ltd., 32,340 Kgs., Rs. 5,53,646.

PYRIDINE: From Belgium: I.E.L. Ltd., 50,800 kgs., Rs. 35,84,376.

SODIUM ACID PYROPHOSPHATE: From Singapore: Asian Peroxide Ltd., 998 Kgs., Rs. 33,942.

SODIUM ALGINATE: From China: Jeelani Tanning Inds., 7,300 Kgs., Rs. 5,94,493.

SODIUM HYDRIDE: From FRG: Dr. Reddy's Labs Ltd., 1,000 Kgs., Rs. 3,87,894.

SODIUM METAL: From FRG: Shasun Drugs, 15,274 Kgs., Rs. 4,89,789; From Hungary: Standard Organics Ltd., 34,800 Kgs., Rs. 5,17,516.

SODIUM METHOXIDE: From FRG: Dr. Reddy's Labs., 9,000 Kgs., Rs. 4,90,429.

SODIUM NITRITE: From Hong Kong: Shasun Chemicals Pvt. Ltd., 40 Mts., Rs. 2,97,424.

SOYA LECITHIN: From Singapore: Nova Magnetics Ltd., 907.2 Kgs., Rs. 95,562.

STEARIC ACID: From Malaysia: Dunlop India Ltd., 22,000 Kgs., Rs. 2,14,216.

TETRAHYDROFURAN: From FRG: Curekraft Chemicals Pvt. Ltd., 8,960 Kgs., Rs. 2,06,815.

THIOUREA: From Japan: Shree Krishna Impex, 17,500 Kgs., Rs. 2,18,573.

TRICHLOROETHYLENE: From Japan: Kunal Engg. Co. Ltd., 33,060 Kgs., Rs. 3,99,166.

TRIMETHOXY BENZALDEHYDE: From China: Savera Labs Ltd., 1,000 Kgs., Rs. 4,07,107.

3,4,5, TRIMETHOXY BENZALDEHYDE: From Netherlands: Standard Organics Ltd., 5,205 Kgs., Rs. 23,21,333.

VANILLIN: From Switzerland: Sivasakthi Perfumery Works, 1,000 Kgs., Rs. 1,83,552; From USA: Bush Boake Allen India Ltd., 1,500 Kgs., Rs. 3,85,057.

VANILLIN TECH: From Norway: Dr. Reddy's Labs Ltd., 8,800 Kgs., Rs. 18,69,510.

VANILLIN USP: From France: Dr. Reddy's Labs Ltd., 9,000 Kgs., Rs. 22,54,575.

PLASTICS MATERIALS IMPORTED MADRAS (From 1.8.90 to 8.8.90)

HDPE: From Japan: Myopcarl Sacks Pvt. Ltd., 15 Mts., Rs. 2,37,084; Polysack Inds., 10 Mts., Rs. 1,58,000; Priya Filament 15 Mts., Rs. 2,37,413; Super Polytex Pvt. Ltd., 30 Mts., Rs. 4,74,134; The Visakha Polypack Inds., 15 Mts., Rs. 2,37,670; From Singapore: Gunarani Trading Co., 20 Mts., Rs. 3,15,128; Integrated Exports, 6 Mts., Rs. 96,631; Integrated Exports, 6 Mts., Rs. 96,631; Inds. Chemicals & Plastics, 16.95 Mts., Rs. 2,55,067; 46.75 Mts., Rs. 6,63,330;

Industrial Chemicals & Plastics, 15.75 Mts., Rs. 2,23,478; Industrial Chemicals & Plastics, 31.50 Mts., Rs. 4,46,956; Polyene General Inds. Ltd., 0.05 Mts., Rs. 1,000; R.N. Polysacks Pvt. Ltd., 7,857 Mts., Rs. 1,09,147; Samex Trading House Inds., 17 Mts., Rs. 2,46,792; Strofid Plastics Pvt. Ltd., 10 Mts., Rs. 1,57,564; Strofib Plastics Pvt. Ltd., 10 Mts., Rs. 1,57,564; Sun Polysacks Pvt. Ltd., 7.875 Mts., Rs. 1,09,147; Sun Polysacks Pvt. Ltd., 7,875 Mts., Rs. 1,09,147; From USA: Hindustan Cables Ltd., 84 Mts., Rs. 23,36,412; Shyam Textiles Pvt. Ltd., 35 Mts., Rs. 5,20,490.

LDPE: From Singapore: Victory Laminations, 15,000 Kgs., Rs. 2,39,417.

POLYETHYLENE: From Japan: Natraj Bags & Syn. Ltd., 20,000 Kgs., Rs. 3,30,796; Kamaragiri Electronics Ltd., 5,975 Kgs., Rs. 7,43,862.

POLYPROPYLENE: From Singapore: Hindustan Plastics Pvt. Ltd., 16 Mts., Rs. 2,32,274; From USA: Lakshmi Polypacks, 49.5 Mts., Rs. 7,99,643; From Singapore: Sri Narasimha Plastic Inds. Pvt. Ltd., 32 Mts., Rs. 4,47,216; Kunal Engg. Co. Ltd., 30 Mts., Rs. 4,46,136.

POLYSTYRENE: From Australia: M.M. Rubber Co. Ltd., 80 Mts., Rs. 14,87,116; From Korea: Beardsell Ltd., 17 Mts., Rs. 4,19,683.

MATERIALS IMPORTED BOMBAY (From 4.6.90 To 5.6.90)

ACRYLAMIDE: From Japan: Arjyot Chemicals Pvt. Ltd., 15,000 Kgs., Rs. 3,92,657; East India Cotton Mfg. Co. Ltd., 1,000 Kgs., Rs. 26,177.

ADIPIC ACID: From FRG: Jain Enterprises, 16,000 Kgs., Rs. 3,62,989.

AEROSIL 200: From Belgium: K. Sevantilal & Co., 1,860 Kgs., Rs. 2,26,907.

ALDEHYDE C-8: From Japan: Industrial Perfumes Ltd., 1,232 Kgs., Rs. 1,50,250.

ALUMINIUM OXIDE: From FRG: Sureshchandra Agarwal & Co., 60,000 Kgs., Rs. 7,62,456.

AMINO ACIDS: From Japan: Wockhardt Ltd., 7,060 Kgs., Rs. 2,72,800.

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ORTHO AMINO PHENOL: From Japan: Hindustan Ciba Geigy Ltd., 250 Kgs., Rs. 74,423.

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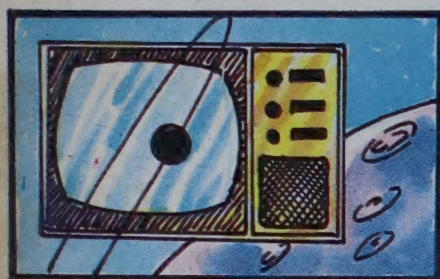
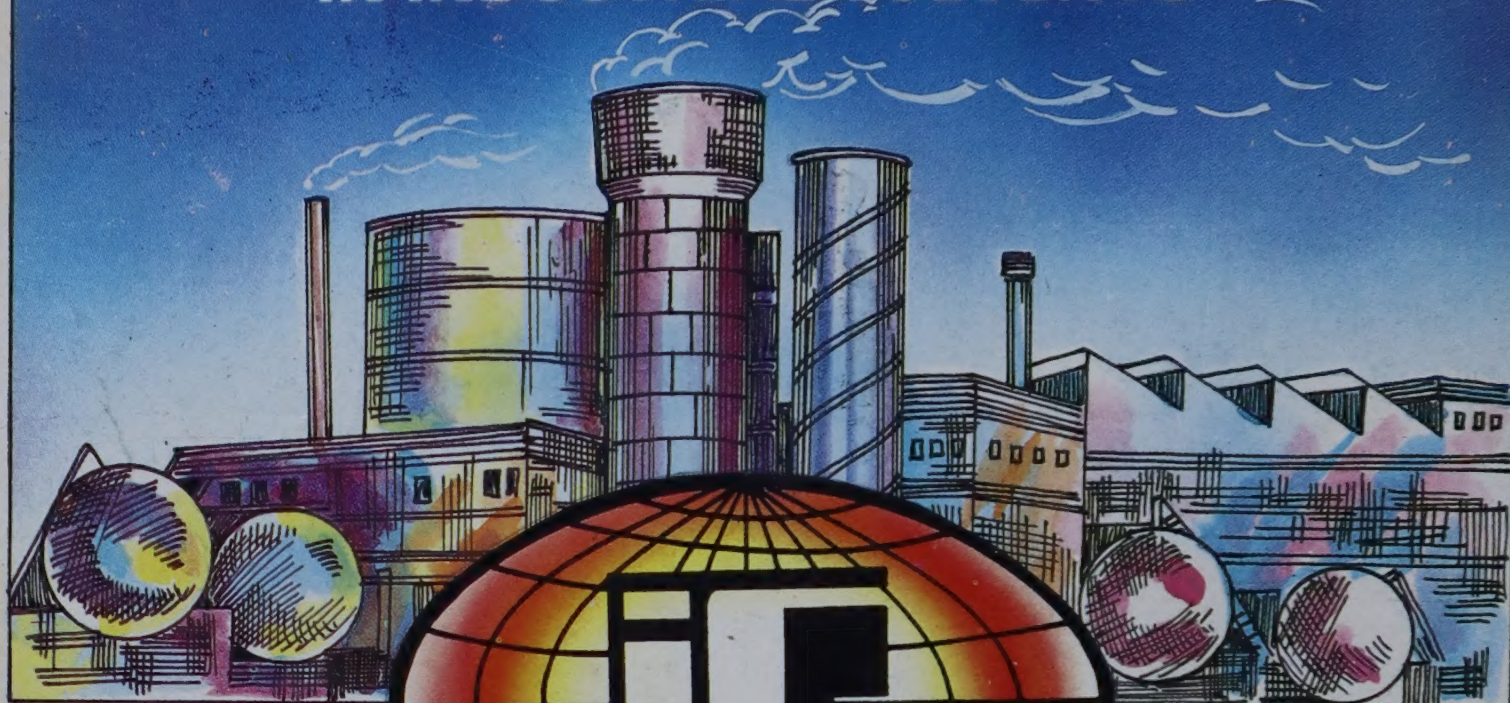
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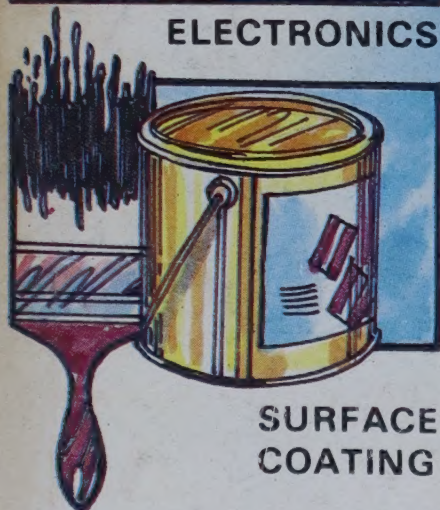
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